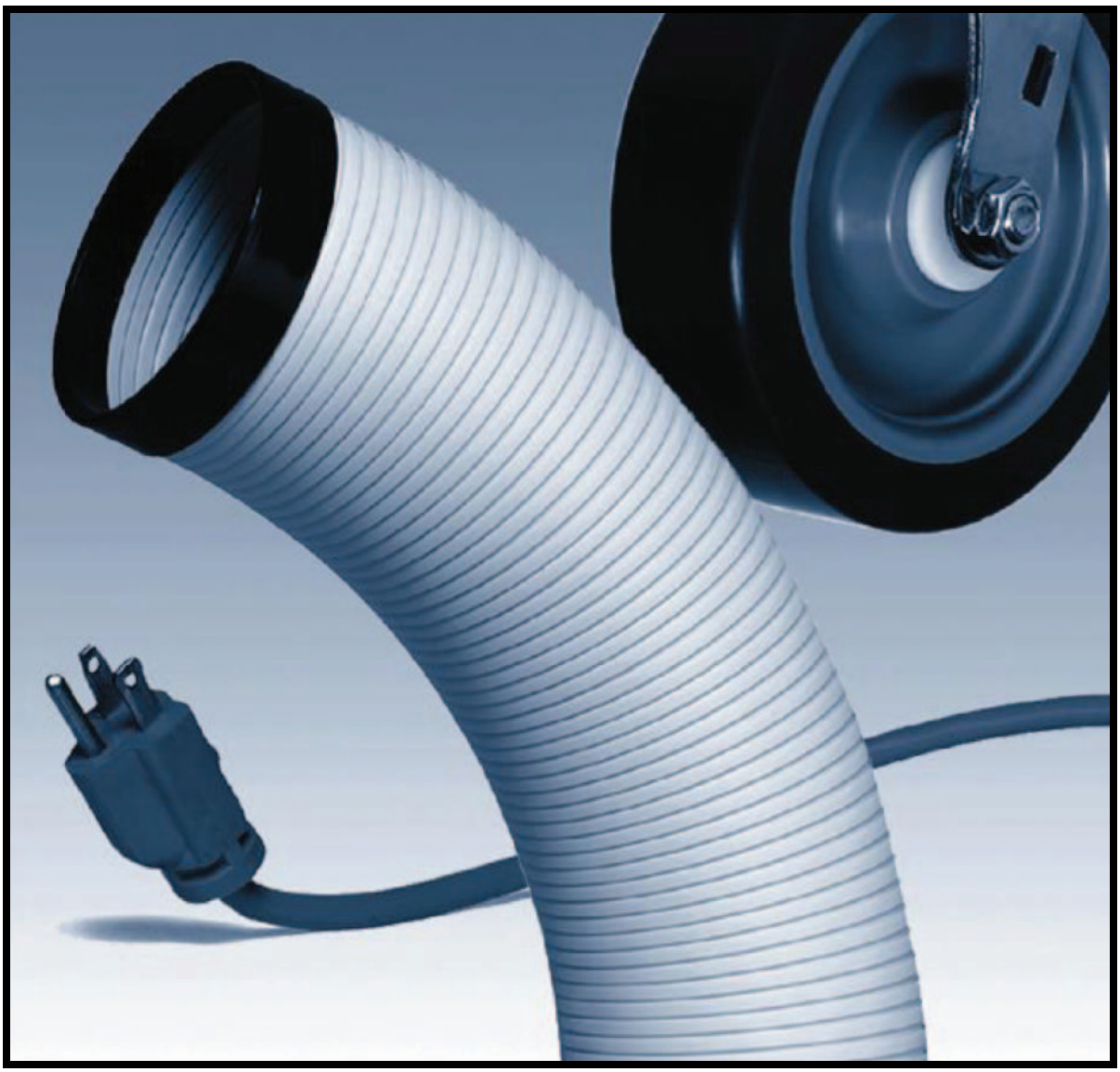
SERVICE MANUAL

Classic10 and Classic18

SERIAL NUMBER FROM JANUARY 2008 (0108) TO DECEMBER 2008 (1208)



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MOVINCOOL®
THE #1 SPOT COOLING SOLUTION

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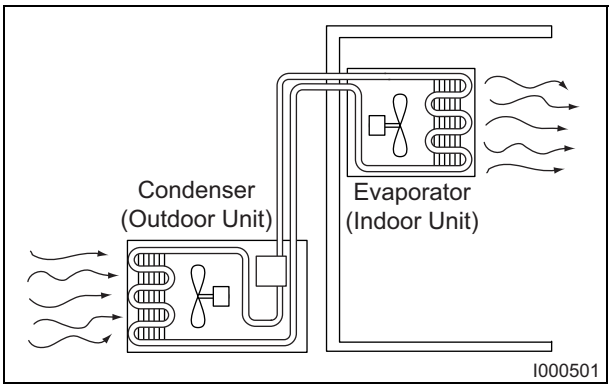
1. GENERAL DESCRIPTION

1.1 Foreword



- In general conventional air conditioners cool an entire enclosed environment. Air conditioners act as “heat exchangers”, requiring an interior unit (evaporator) to blow cool air into the interior, and an exterior unit (condenser) to exhaust exchanged heat to the outdoors.
- Unlike conventional air conditioners, the MovinCool Spot Cooling System is a spot cooler that directs cool air to particular areas or objects. MovinCool Spot Cooling Systems have the following features:

1.2 Features

(1) Compact design

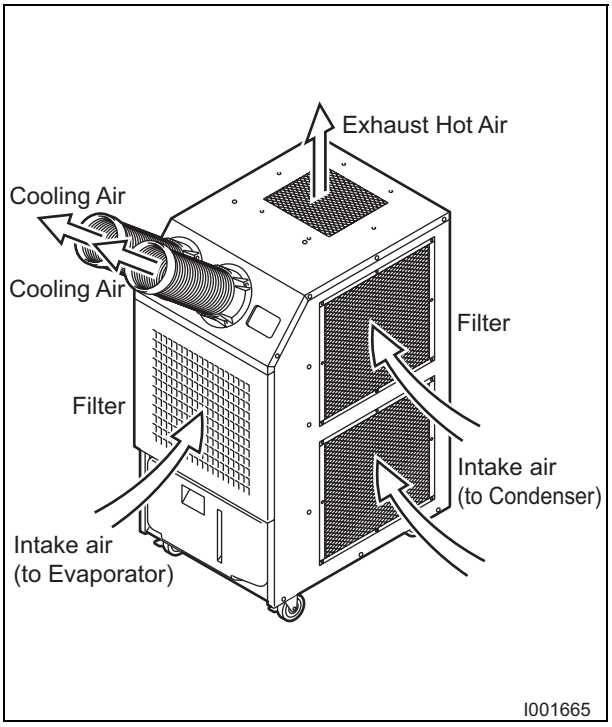
- The innovative design of MovinCool has resulted in one compact device, replacing the need for two separate units.

(2) Easy transportation and installation

- With the entire cooling system built into one compact unit, MovinCool requires no pipe work and can be transported and installed easily.

(3) Energy conservation

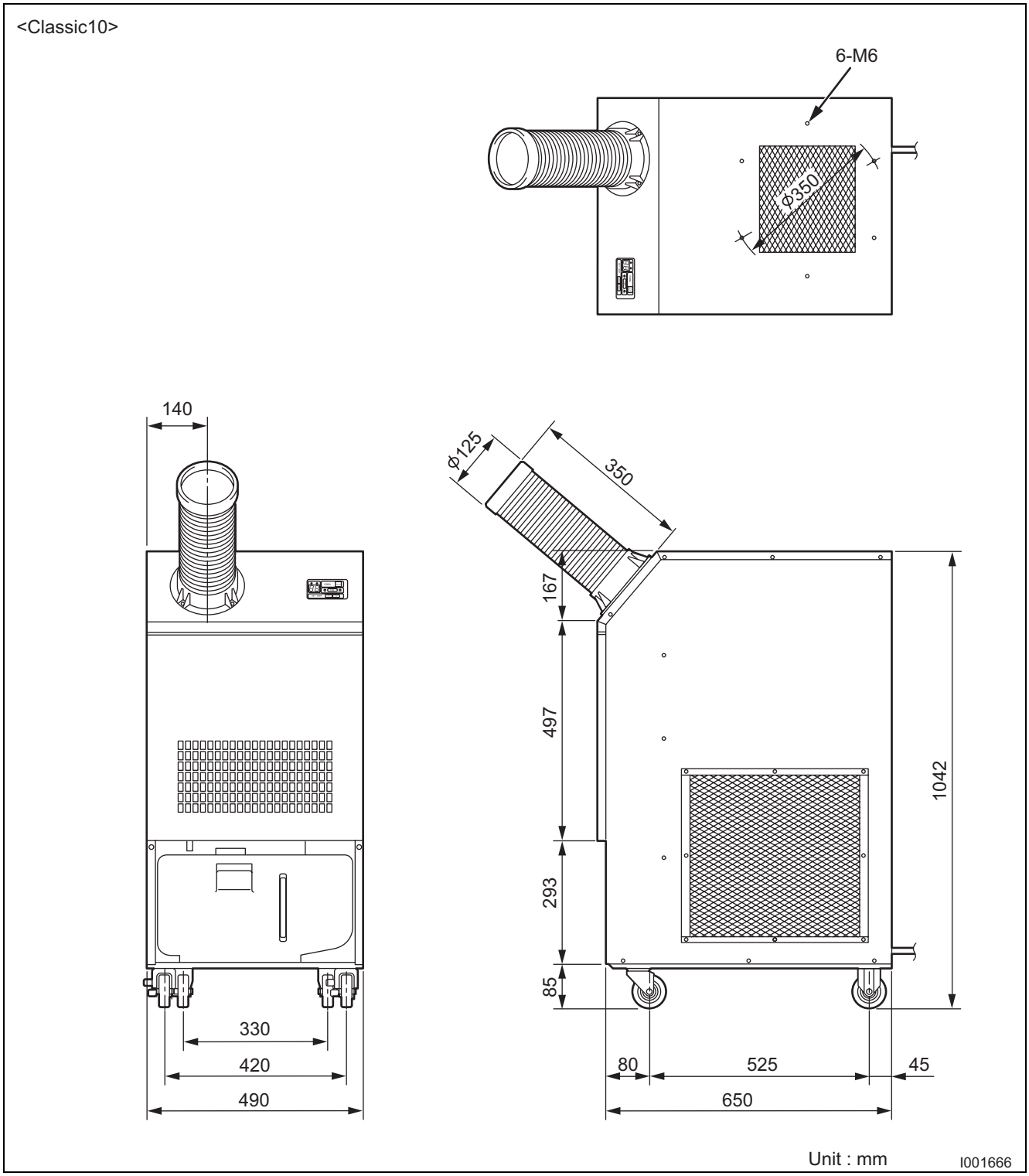
- MovinCool is economical because only the required area or object is cooled rather than an entire enclosed environment.



2. SPECIFICATIONS

2.1 Exterior Dimension Diagram

<Classic10>



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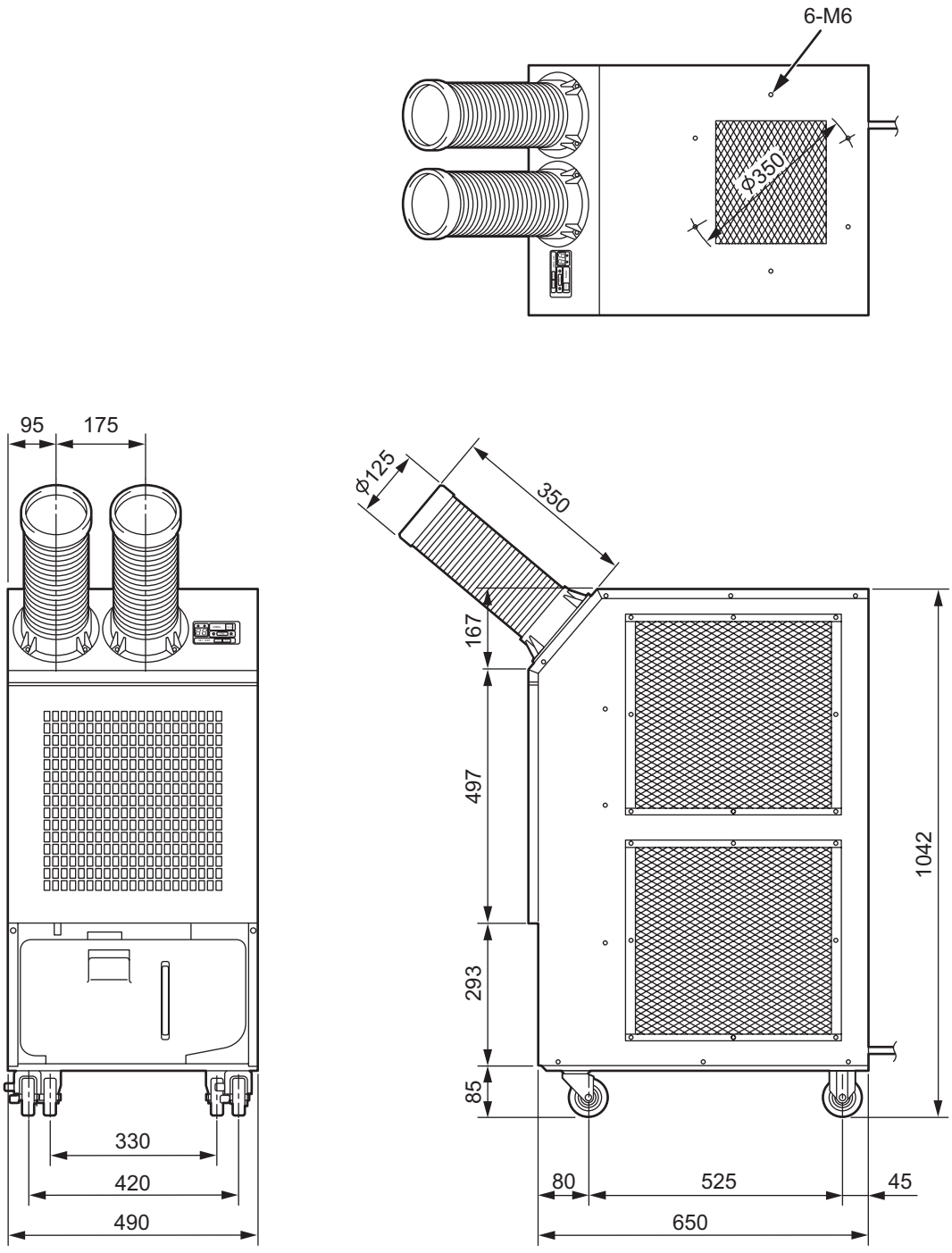

Unit : mm

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2.2 Technical Specifications

Technical Specifications		Classic10	Classic18
Electronic Features	Control Panel	Electronic	
	Thermostat Control	Electronic	
Cooling Capacity	Rating Condition: 95 °F 60 %RH	2.92 kW (2520 kcal/h) 10,000 BTU/h	5.27 kW (4540 kcal/h) 18,000 BTU/h
Electrical Characteristics	Voltage Requirement	1 Phase, 115 V, 60 Hz	1 Phase, 208/230 V, 60 Hz
	Total Power Consumption	1.1 kW	2.1 kW
	Current Consumption	10.0 A	10.8/10.0 A
	Recommended Fuse Size	15 A	15 A
	NEMA Plug Configuration	5-15	6-15
	Min.-Max. Voltage	105-125 V	198-250 V
Fans	Fan Type	Sirocco Fan	
	Air Volume	450 m^3/h (265 CFM)	880/900 m^3/h (518/530 CFM)
	Motor Output	0.14 kW	0.35 kW
Compressor	Type	Hermetic Rotary	
	Output	0.6 kW	1.10 kW
Refrigerant Charge	R-22	0.48 kg (1.06 lbs)	0.72 kg (1.59 lbs)
Dimension	W x D x H *without air duct	492 x 673 x 1054 mm (19.4 x 26.5 x 41.5 inches)	
Net Weight/Shipping Weight		66/83 kg (145/183 lbs)	76/94 kg (167/208 lbs)
Power Cord	Gauge	14 AWG (3-core)	
	Length	3.0 m (10 ft.)	1.8 m (6 ft.)
Condensate Tank Capacity		19 L (5 gal)	
Operating Conditions	Min.-Max. (@50 %RH)	70-105 °F (21-40 °C) (#1)	
Max.Duct Length (#2)	Cold Duct Hose	12 m (40 ft.)	15 m (50 ft.)
	Hot Duct Hose	18 m (60 ft.)	18 m (60 ft.)
Max.Static Pressure	Cold Duct Hose	0.33 IWG	0.52 IWG
	Hot Duct Hose	0.13 IWG	0.25 IWG
Max.Sound Level	With Condenser-Duct High/Low	55 dB (A)	63 dB (A)
	Without Condenser-Duct High/Low	58 dB (A)	67 dB (A)

#1: When ambient temperature is lower than 77 °F, operation may cease due to anti-freeze protection activation.
#2: Confirm pressure drop of duct, filter with manufacturer's specifications.

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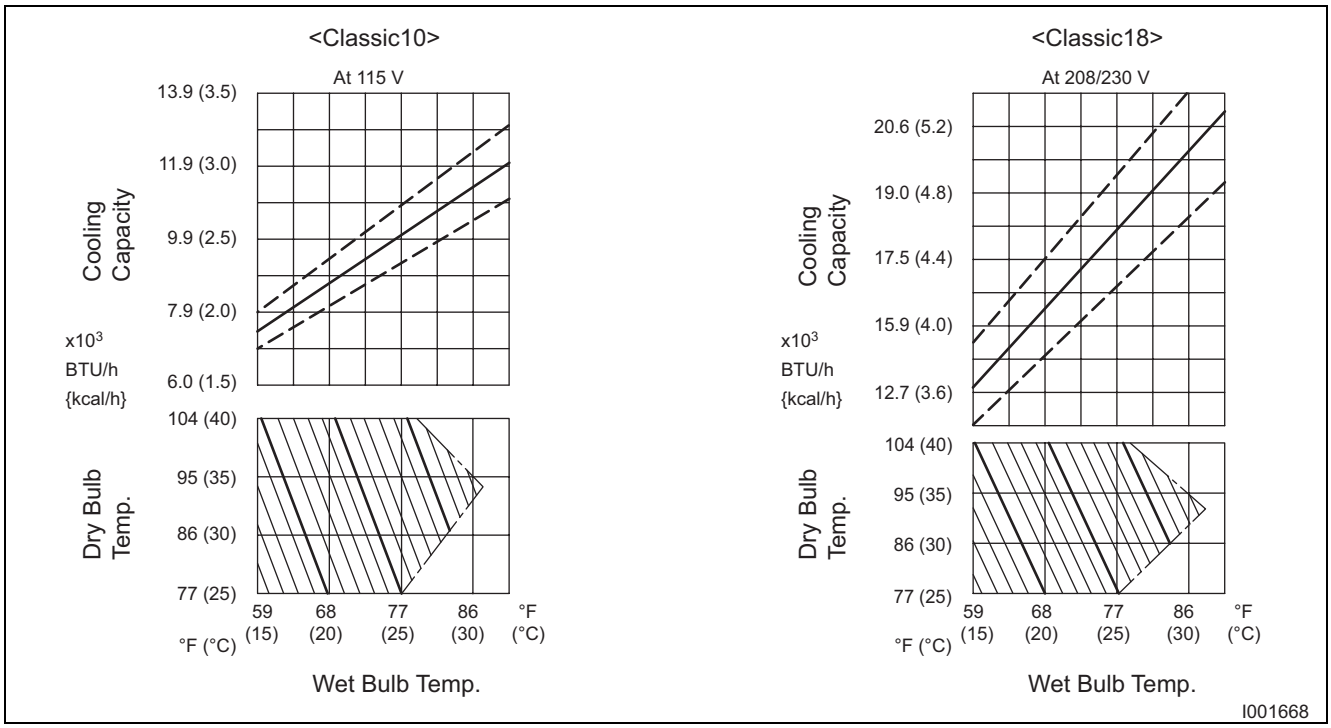
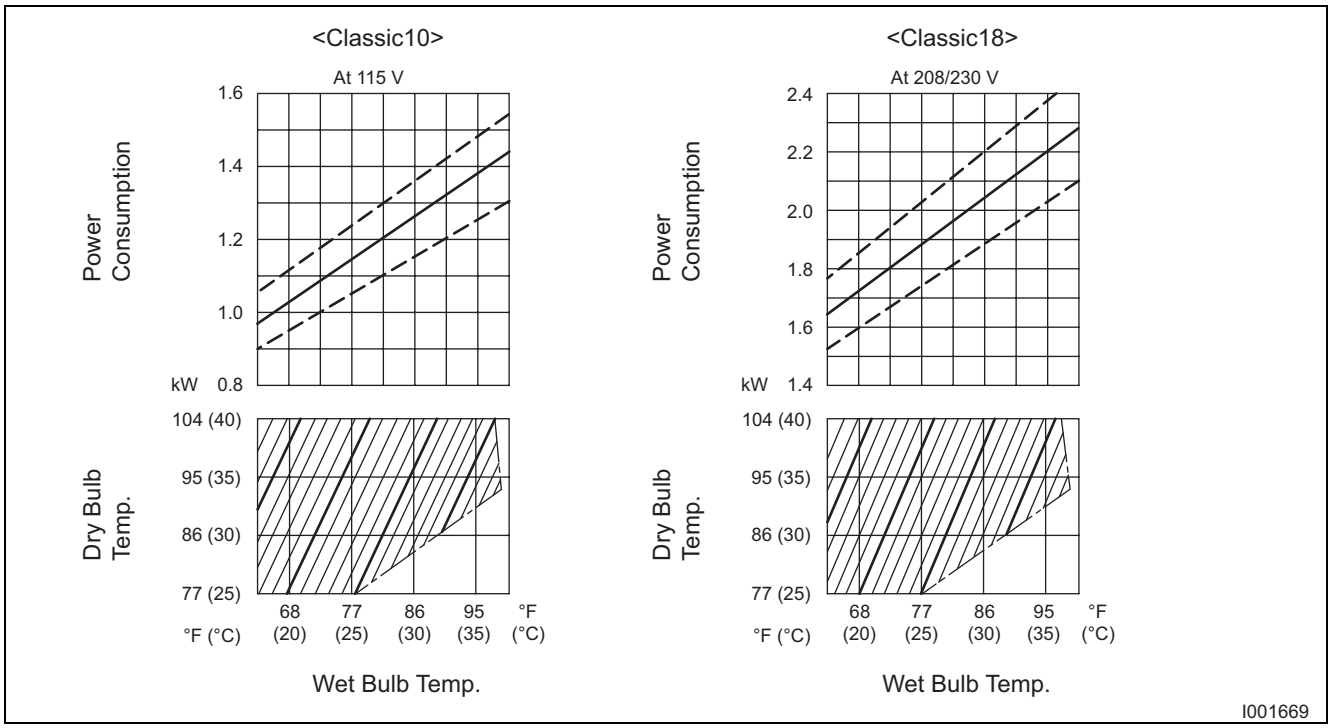
2.3 Characteristics

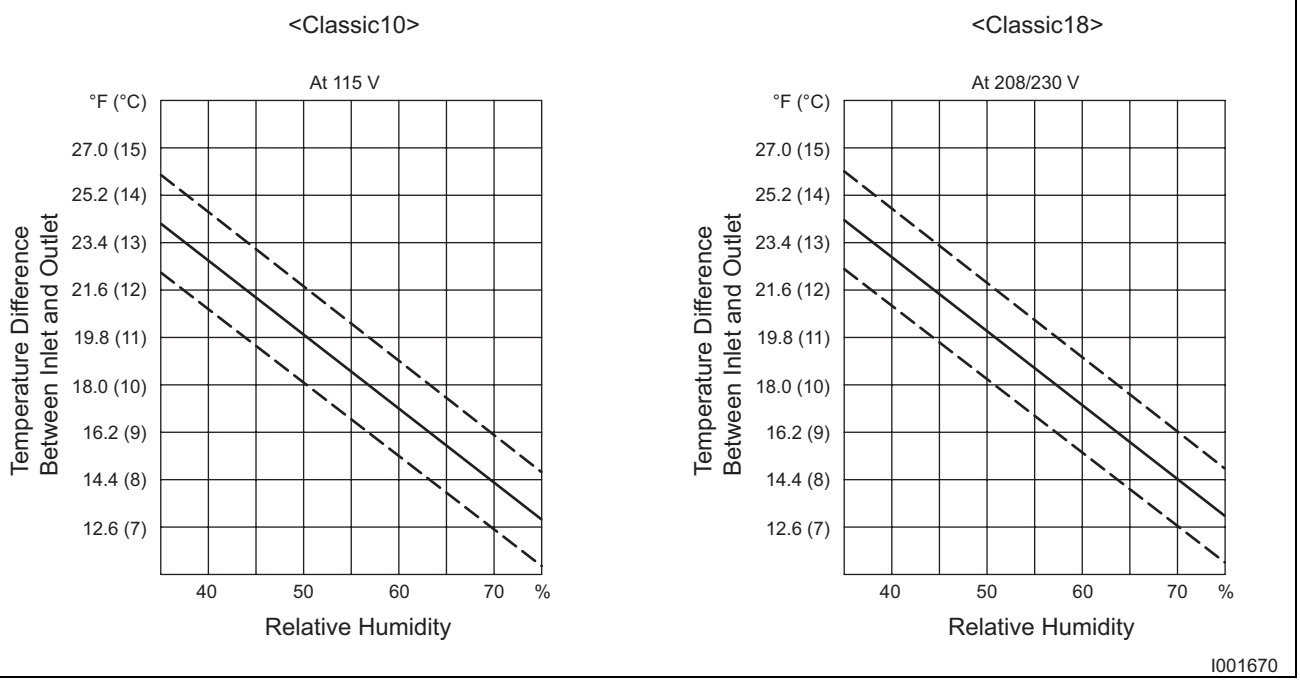
(1) Cooling capacity curve



(2) Power consumption curve



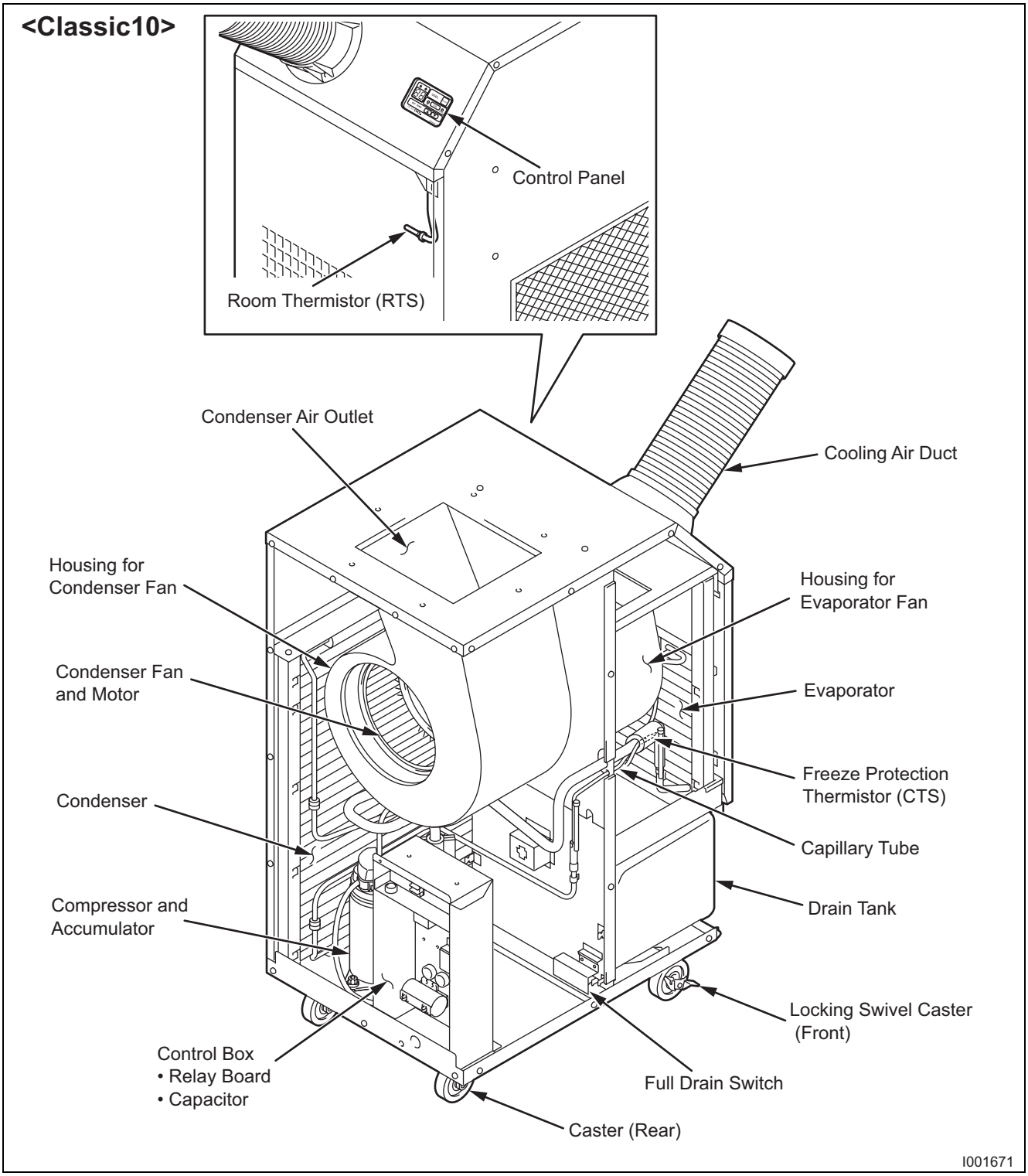
(3) Cool air temperature difference curve

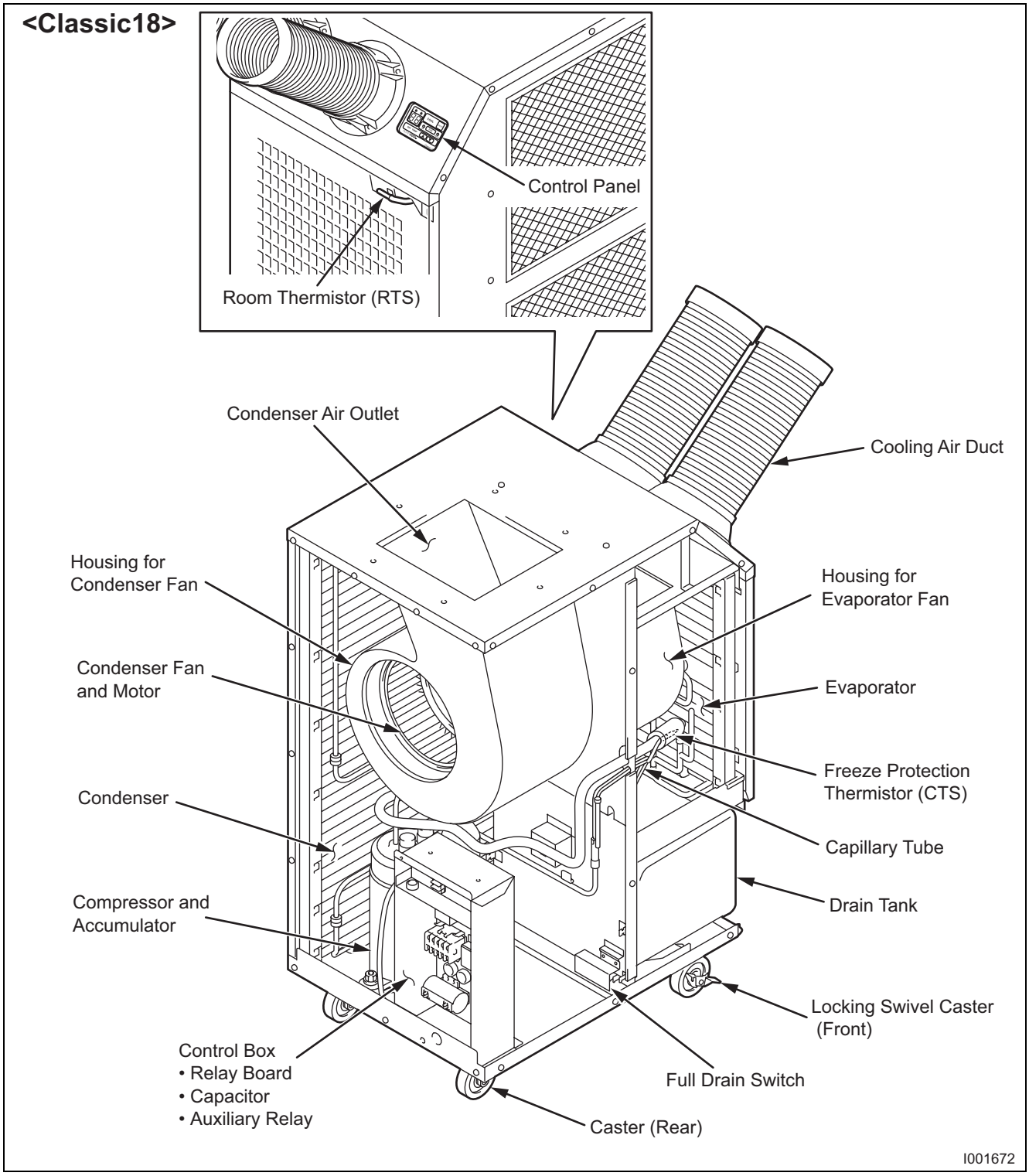


3. CONSTRUCTION

3.1 Internal Structure

<Classic10>




<Classic18>
Control Panel
Room Thermistor (RTS)
Condenser Air Outlet
Cooling Air Duct
Housing for Condenser Fan
Housing for Evaporator Fan
Condenser Fan and Motor
Evaporator
Freeze Protection Thermistor (CTS)
Condenser
Capillary Tube
Drain Tank
Compressor and Accumulator
Locking Swivel Caster (Front)
Control Box
• Relay Board
• Capacitor
• Auxiliary Relay
Full Drain Switch
Caster (Rear)
I001672

4. REFRIGERANT SYSTEM

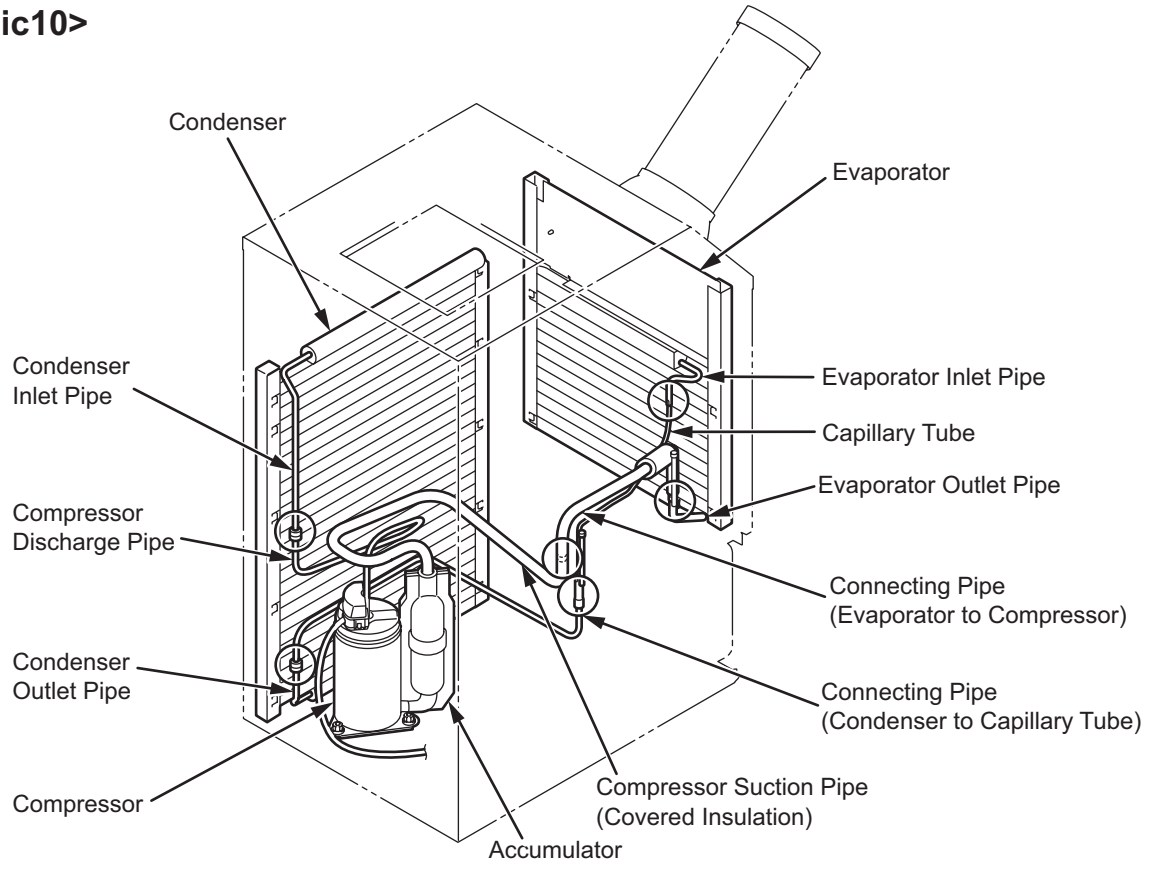
4.1 Refrigerant System Construction

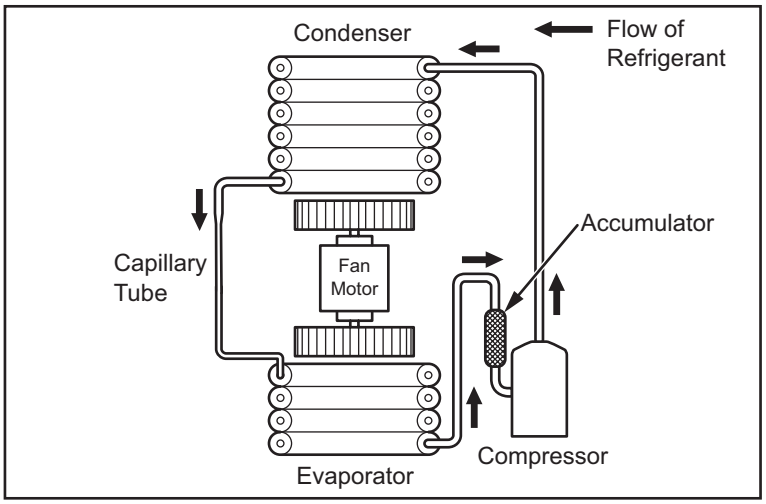
The component parts of the refrigerant system include the following:

- Compressor, Evaporator, Condenser, Accumulator, Capillary tube

The parts above are all connected by copper piping with brazed connections. The circled portion in the figure below shows the part connections.

<Classic10>





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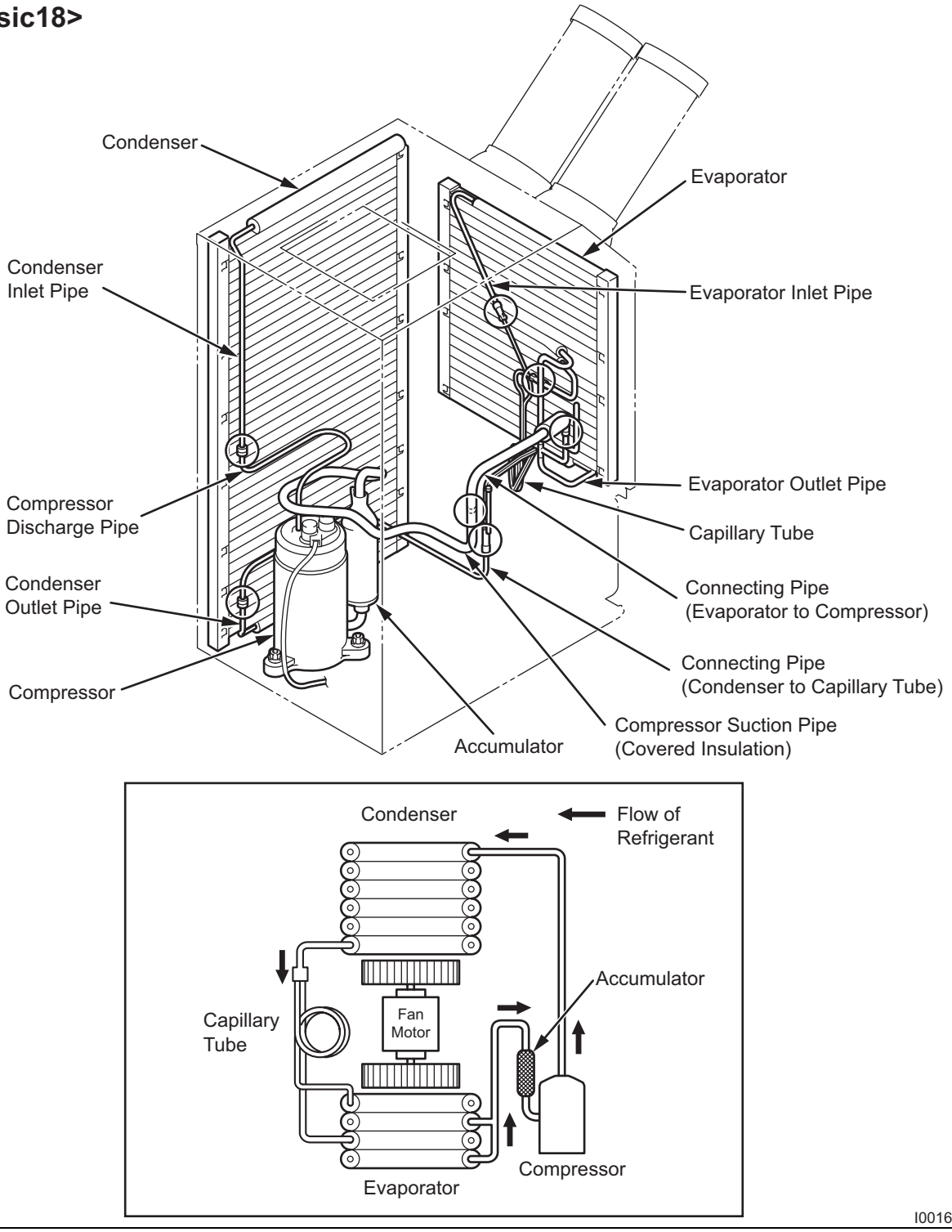
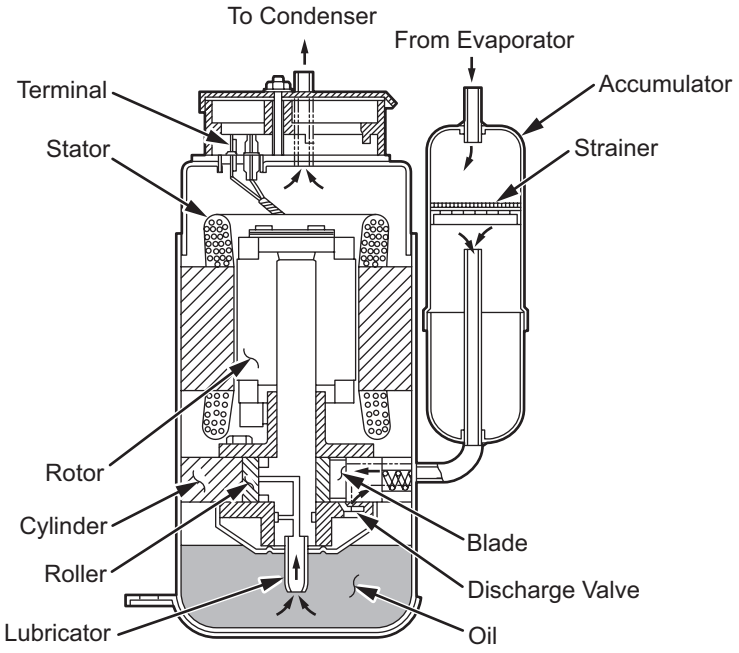

Condenser
Evaporator
Condenser Inlet Pipe
Evaporator Inlet Pipe
Compressor Discharge Pipe
Evaporator Outlet Pipe
Capillary Tube
Condenser Outlet Pipe
Connecting Pipe (Evaporator to Compressor)
Connecting Pipe (Condenser to Capillary Tube)
Compressor
Accumulator
Compressor Suction Pipe (Covered Insulation)
Condenser
Flow of Refrigerant
Accumulator
Capillary Tube
Fan Motor
Compressor
Evaporator
I001674

4.2 Compressor

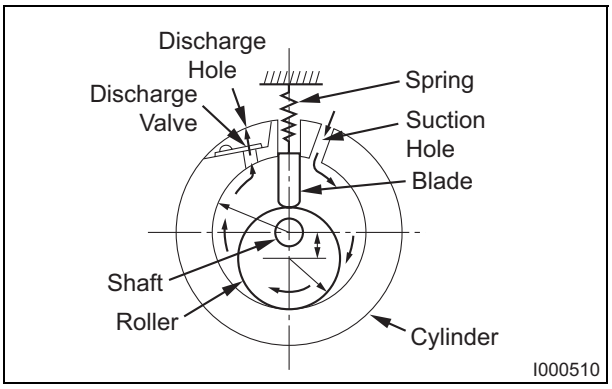
- The compressor used for the unit is hermetically sealed. The compressor and the compressor motor are in one casing.

(1) Compressor construction

- The construction of a rotary type compressor is divided into two mechanisms; the drive mechanism (compressor motor), and the compression mechanism (compressor). When the rotor shaft of the motor (drive mechanism) turns, the roller (compression mechanism) rotates to compress the refrigerant.

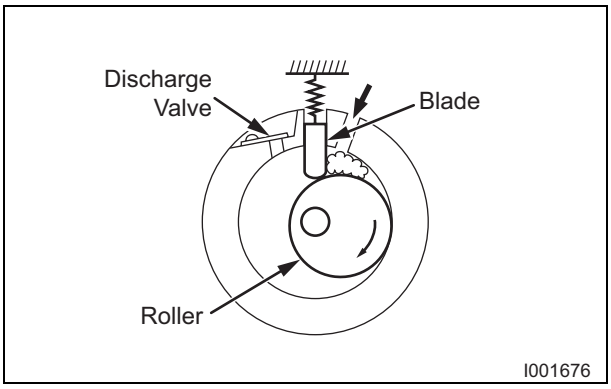


(2) Basic compressor operation



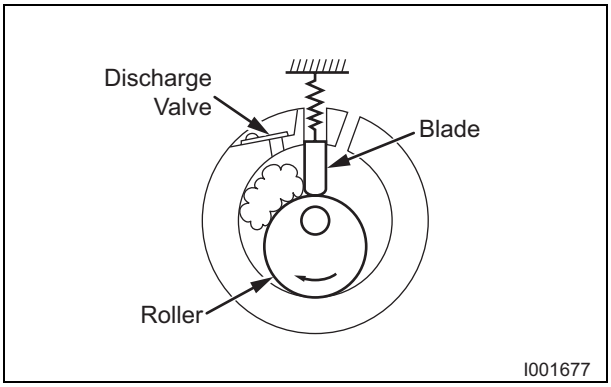
• The roller (compression mechanism) is set eccentrically with a certain distance given from the axis of the center of the cylinder. A spring loaded blade is mounted on the cylinder. The roller turns to compress the refrigerant in the space between the cylinder and eccentrically mounted roller. The blade is in contact with the roller by means of spring force. The blade partitions the space between the suction side and the discharge side to keep compressed refrigerant from returning to the suction side. There is no suction valve. The discharge valve is designed not to open until the pressure of the refrigerant within the cylinder reaches or exceeds discharge side pressure. As a result, the discharge valve prevents the backward flow of refrigerant gas.

(3) Operation



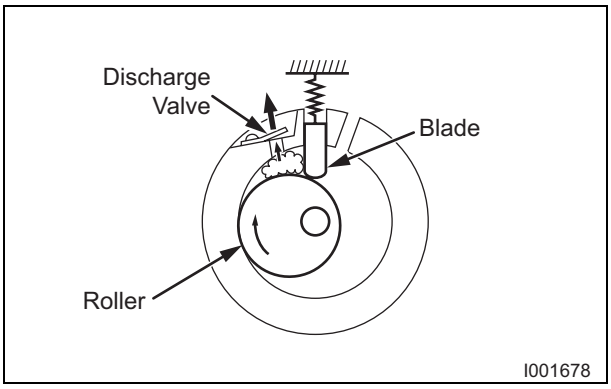
1) Start of compression

1) The cylinder is filled with low pressure gas.
2) Since pressure in the discharge chamber is higher than in the cylinder, the discharge valve is kept closed.



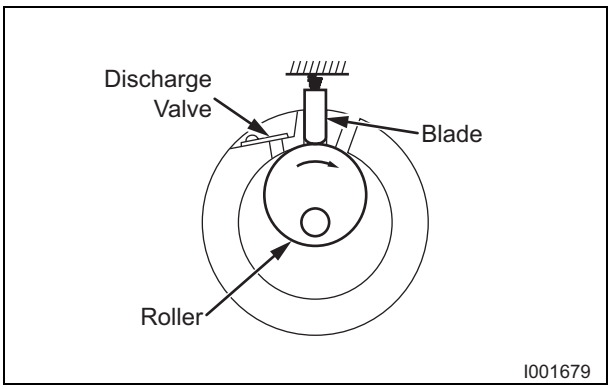
2) Suction and compression

1) The pressure in the cylinder increases gradually.
2) Refrigerant suction begins on the suction side of the cylinder.
3) The discharge valve remains closed.



3) Discharge

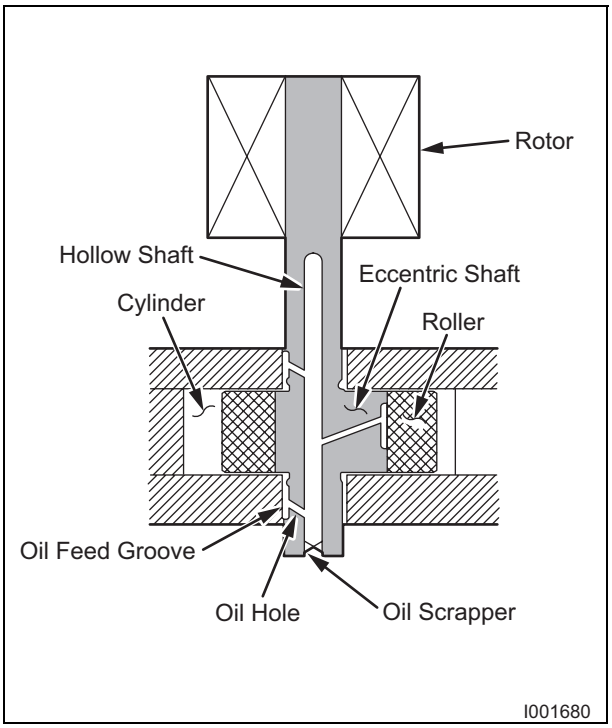
1) The pressure in the cylinder exceeds that in the discharge chamber, and the discharge valve opens.
2) On the suction side, refrigerant suction continues.



4) Completion of compression

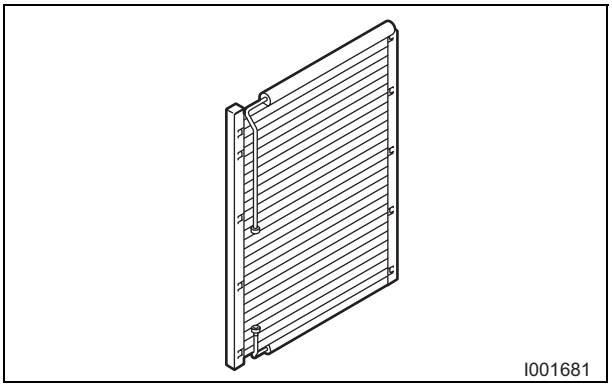
1) When compression is completed, all of the refrigerant has been drawn from the suction chamber.
2) Operation then returns to step 1) (Start of compression) and the above process of suction and compression continues repeatedly in succession.

(4) Compressor lubrication



• The lubrication system is comprised of a hollow shaft, an oil scraper mounted at the end face, hollow shaft, a shaft journal (shaft bearing), and the lubrication groove for the shaft journal. The lubrication groove is wider than the oil hole. When the shaft turns, oil is scraped upward by the oil scraper along the inside diameter of the hollow shaft. The oil is fed through the oil hole by centrifugal force, then supplied to the lubrication groove for each shaft journal, lubricating the bearing. In this lubrication system, oil enters into each bearing separately and returns to the oil reservoir. This system effectively prevents bearing temperature increases, and offers high reliability. In addition, the specially treated shaft journal keeps the bearing from being damaged during high temperature operation.

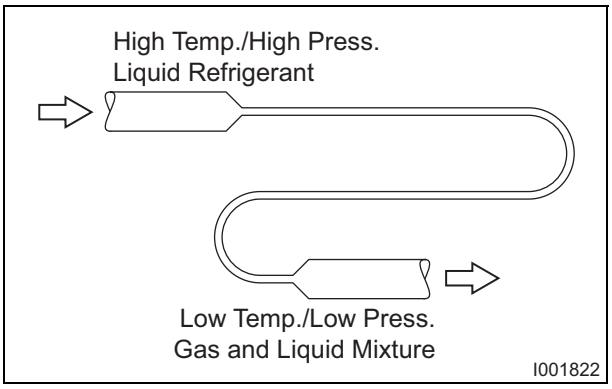
4.3 Condenser



• The condenser is a spine-fin type heat exchange device consisting of copper tubes passing through an aluminum fin.

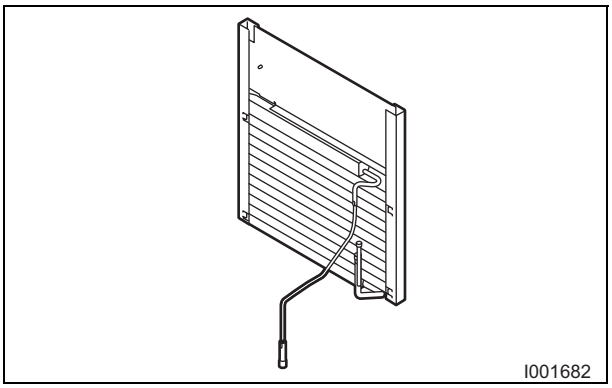
• Heat is given off and absorbed by air being pulled across the condenser fins by the centrifugal fan. The air is then expelled through the exhaust air duct.

4.4 Capillary Tube



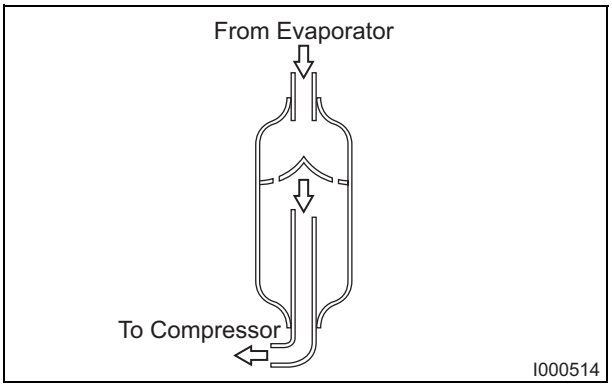
• The capillary tube is a long thin tube that utilizes line flow resistance as an expansion valve. The length and the inner diameter of the capillary tube are determined according to the capacity of the refrigeration system, operating conditions, and the amount of refrigerant. The high-pressure, high-temperature liquid refrigerant sent from the condenser expands rapidly as the refrigerant is sprayed out through the fixed orifice in the capillary tube. As a result, the temperature and state of the refrigerant become low and mist-like, and therefore evaporates easily.

4.5 Evaporator



• The evaporator, like the condenser, is a heat exchanger covered with spine fins. Heat is removed from the air being pulled across the evaporator by the centrifugal fan. The resulting cool air is expelled through the cooling air ducts.

4.6 Accumulator



• The accumulator is mounted on the suction gas piping between the evaporator and the compressor. The accumulator separates the liquid refrigerant from the gas refrigerant, allowing only the gas refrigerant to enter the compressor. In the accumulator, suction gas is led into a cylindrical vessel where the speed of the gas is decreased. This process separates the refrigerant contained in the gas by the force of gravity, causing the refrigerant to accumulate at the bottom of the vessel. As a result, the compressor is protected from possible damage caused by liquid refrigerant intake.

5. ELECTRICAL SYSTEM

5.1 Circuit Diagram

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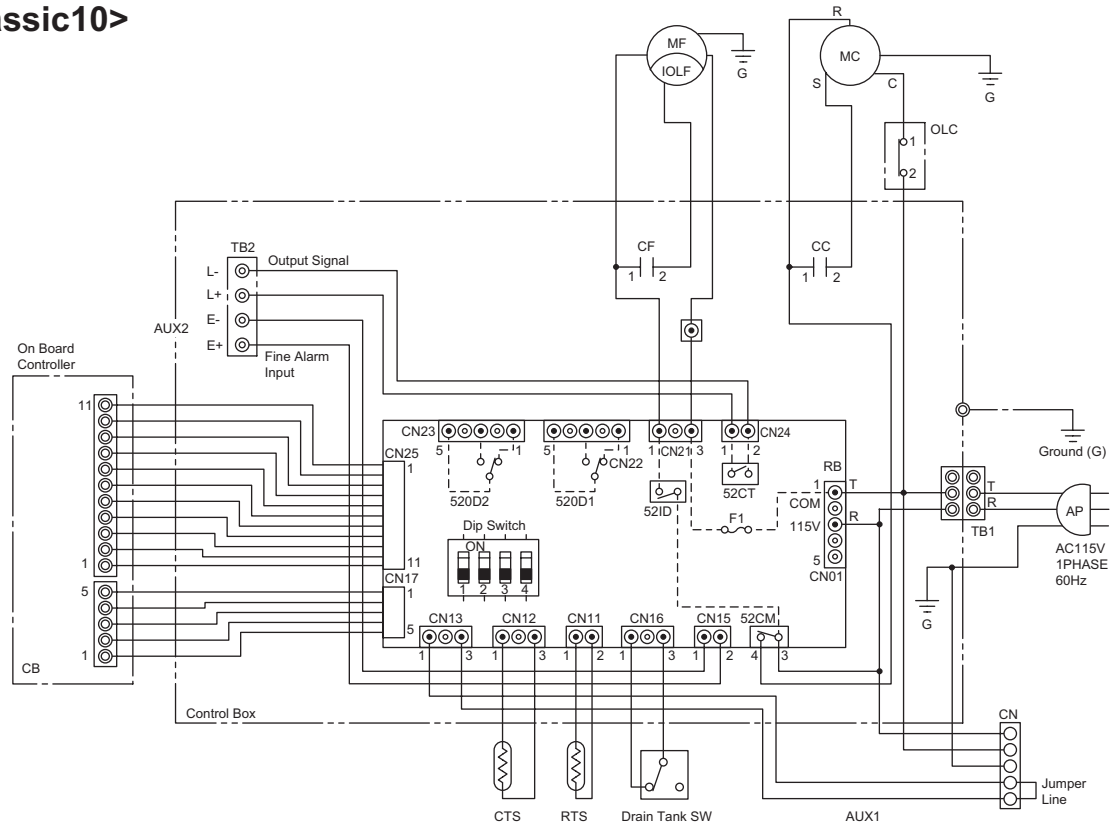
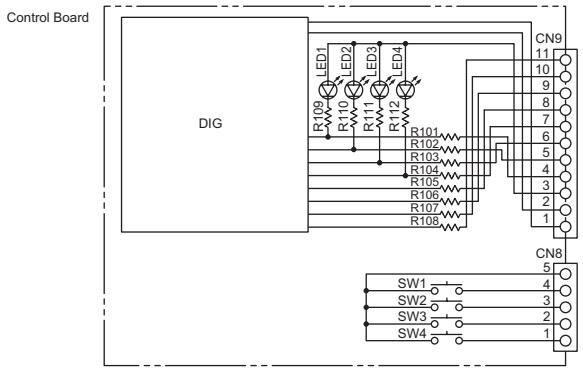


TB1	Terminal Block1	CN	Connector for Option Drain Pump
TB2	Terminal Block2		
RB	Relay Board	CTS	Freeze Protection Thermistor
MF	Fan Motor	RTS	Room Thermistor
MC	Compressor Motor	G	Ground
CF	Capacitor for Fan Motor	CB	Control Board
CC	Capacitor for Compressor		
OLC	Overload Protector		



SW1	COOL ON/OFF Switch
SW2	FAN Switch
SW3	SET TEMP ▽ Switch
SW4	SET TEMP △ Switch

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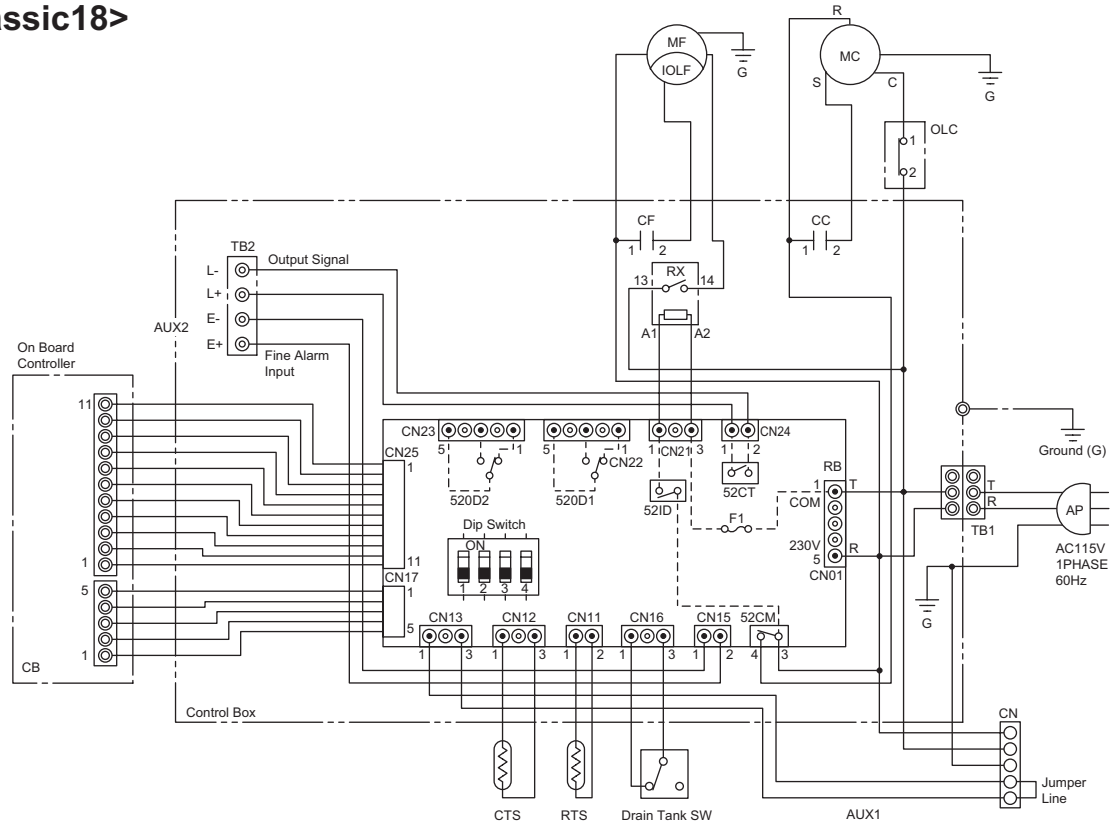
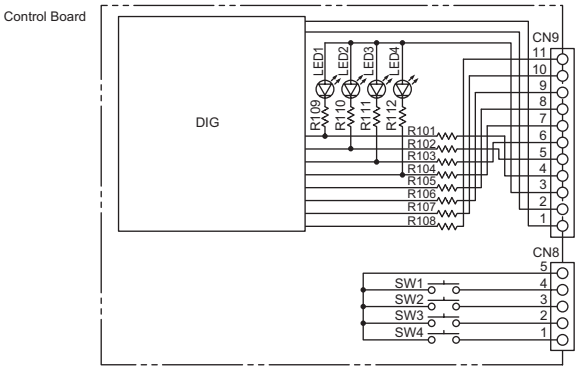
<Classic18>



TB1	Terminal Block1	CN	Connector for Option Drain Pump
TB2	Terminal Block2		
RB	Relay Board	CTS	Freeze Protection Thermistor
MF	Fan Motor	RTS	Room Thermistor
MC	Compressor Motor	G	Ground
CF	Capacitor for Fan Motor	CB	Control Board
CC	Capacitor for Compressor	RX	Auxiliary Relay
OLC	Overload Protector		



SW1	COOL ON/OFF Switch
SW2	FAN Switch
SW3	SET TEMP ▽ Switch
SW4	SET TEMP △ Switch

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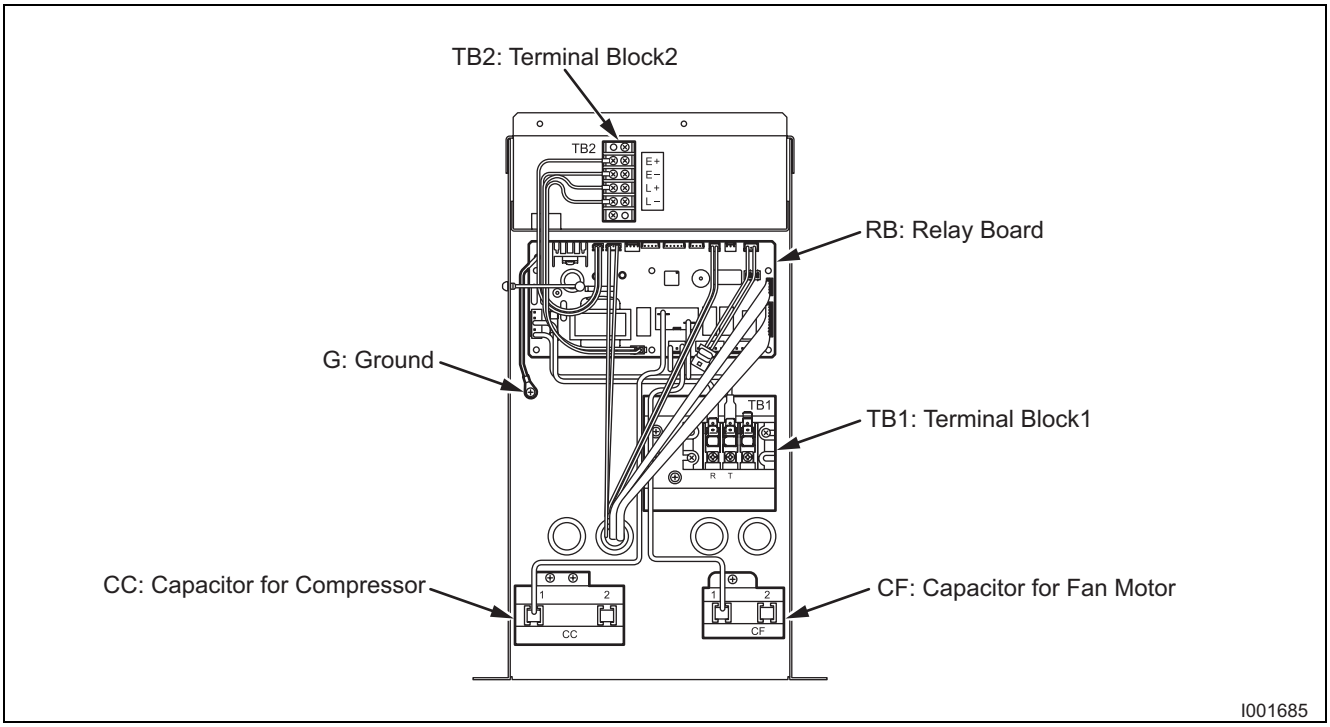
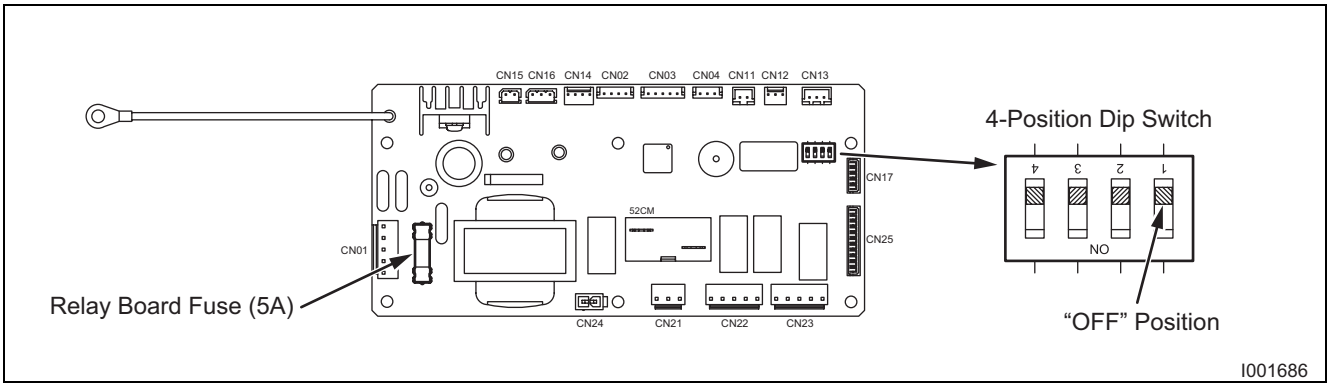
5.2 Control Box and Relay Board

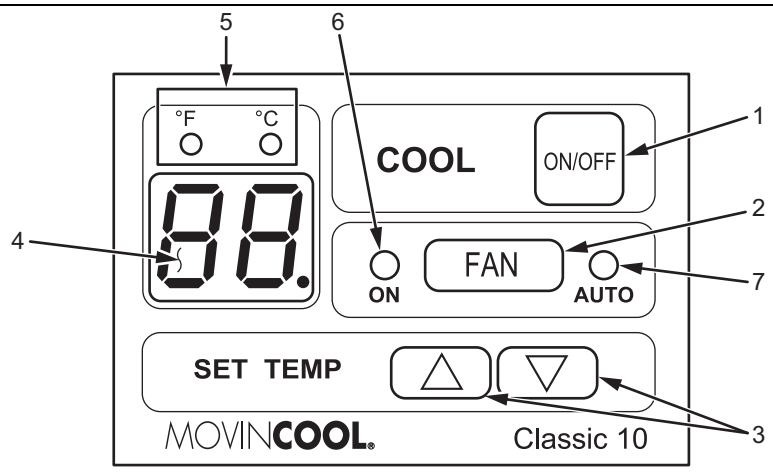




5.3 Basic Operation

(1) Control panel

• Before operating the unit, it is important to be familiar with the basic operation of the control panel.



1	COOL ON/OFF Button	Activates/deactivates the cool mode; turns the unit off.
2	FAN Button	Activates/deactivates the fan only mode; turns the unit off.
3	SET TEMP Buttons (△/▽)	Increases/decreases the temperature set point during cool mode.
4	Room Temperature/ Set Point Display	Shows a blinking set point temperature for five seconds, then continuously indicates room temperature.
5	Temperature Scale LED	Illuminates to indicate the current temperature being displayed is either in °C or °F.
6	ON LED	Illuminates during fan only mode and cool mode using fan operate mode.
7	AUTO LED	Illuminates during cool mode using fan stop mode.

[LED Display Indication] In normal operation, LED displays the following indication.

Display	Indication	Conditions
.	Right decimal segment is on	Power stand by or during fan only mode
78	Indicates room temperature when display is solid. (Left fig. : Room temp. at 78 °F)	During cool mode
75	Indicates set point temperature when display is flashing. (Left fig. : Set Point temp. at 75 °F)	During set point temperature adjustment or cool mode on. (5 seconds)

I001710

< NOTE >

• The room temperature display range is from 0 to 109 °F.
(When displayed in "°C " the range is from -9 °C to 60 °C)

• In Fahrenheit only, when the display value is greater than 99 °F, 100 °F, 101 °F, and 109 °F are displayed as "00", "01", and "09" respectively.

(2) Fan only mode

- When the FAN button on the control panel is pressed, the FAN “ON” LED illuminates, and the fan operates. At this time, the compressor is off, and only the fan is in operation. When the FAN button is pressed again, the fan stops.

(3) Cool mode

- When the COOL ON/OFF button is pressed, the FAN “ON” LED illuminates, and room temperature is shown on the display. At this time, the compressor and fan begin to operate to provide cooling. When the COOL ON/OFF button is pressed again, the compressor and fan stop.
- When the COOL ON/OFF button is pressed in fan only mode, room temperature is shown on the display, and the compressor operates to provide cooling. If room temperature reaches the set temperature during cooling operations, the compressor stops, and only the fan continues to operate. (Fan operate mode: * Initial setting)

< NOTE >

The fan only mode will not operate after the cool mode has been activated. Once the cool mode is activated, the unit cannot be turned off by pressing the fan button. Rather, the COOL ON/OFF button must be pressed.

***Fan stop mode**

- In fan stop mode, if room temperature reaches the set temperature during cooling operations, both the compressor and fan stop. The fan stop mode setting can be changed using the dip switch on the relay board. (For details, refer to page 26). During cooling operations when in the fan stop mode, the FAN “AUTO” LED illuminates.

(4) Change temperature mode “°C” and “°F”

- The temperature display can be switched between “°C” and “°F” by holding the SET TEMP arrow buttons (△, ▽) and the FAN button down simultaneously for at least three seconds.

(5) Diagnostic code

- Most of the diagnostic codes can be RESET by holding the SET TEMP arrow buttons (△, ▽) down simultaneously for at least three seconds. (For details, refer to “Self-Diagnosis Codes”.)

5.4 Relay Board

• The relay board contains the compressor and fan on relays, in addition to a step-down transformer that converts the line voltage (Classic10: 115 VAC, Classic18: 208/230 VAC) to 12 V. This voltage is then converted from AC to DC and used for relay coil activation. The 12 V (DC) power is sent to the control panel assembly, further being reduced to 5 V for the system logic. Lastly, the relay board also contains the dip switch.

(1) Power supply requirements

• The Classic10 requires a single-phase 115 V, 60 Hz power supply, while the Classic18 requires a single-phase 208/230 V, 60 Hz power supply.

(2) Relay board fuse

• The relay board fuse is the only serviceable component on the relay board assembly. This fuse provides protection against damage to the step-down transformer. The fuse must be replaced with the exact same part, or a suitable equivalent.

- Fuse Specifications: 5A 250 VAC

⚠ CAUTION

Failure to use the exact same fuse may result in damage to the unit and/or components, and will also void the unit warranty.

(3) Input signal

• The relay board receives inputs from the control panel, sensors, and external devices to perform device control.

Control Panel Input

Symbol	Indication	Function	Connector
SW1	ON/OFF Button	On/off control for unit operation. Turns the unit on and off.	CN17
SW2	FAN Button	Changes the fan control mode between continuous and automatic on/off control.	
SW3	SET TEMP △ Button	Increases the set temperature.	
SW4	SET TEMP ▽ Button	Decreases the set temperature.	

Sensor Input

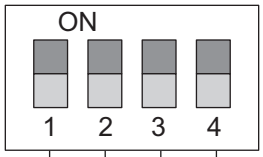
Symbol	Type	Specification			Connector
		Characteristic	"Short" Detection	"Open" Detection	
RTS	Room Thermistor	5k Ω at 77 °F (25 °C) B=3,970 K	181 °F (83 °C) or more	-29 °F (-34 °C) or less	CN11
CTS	Freeze Protection Thermistor	5k Ω at 77 °F (25 °C) B=3,970 K	181 °F (83 °C) or more	-29 °F (-34 °C) or less	CN12

External Input Signal Specification

Symbol	Signal	Specification	Function	Connector
AUX2	Fire Alarm Input	On: Between 10 to 20 mA at DC12 V (Off: No signal)	On: Activates "Defect control" (Contact: Normally open) LED shows "AL", Output signal "ON" On board buzzer sound	CN15
TANK FULL S/W	Tank Full Switch	On: Between 10 to 20 mA at DC12 V (Off: No signal)	Off: Activates "Defect control" (Contact: Normally closed) LED shows "FL", Output signal "ON"	CN16
AUX1	External Pump Failure	On: Between 10 to 20 mA at DC12 V (Off: No signal)	Off: 1) < 180 sec.: Compressor stops. 2) 180 sec.<: Compressor stops. LED shows "AS" output signal "ON"	CN13

(4) Dip switch setting

- The controller is equipped with a four position dip switch that defaults in the OFF position. The dip switch can be set to configure the following functions:



Symbol	Item	Function
DSW4	Buzzer	On --- Disable "onboard buzzer" Off --- Valid
DSW3	-	N/A
DSW2	-	N/A
DSW1	Fan Mode	Change Fan Mode On --- Fan stop mode (Fan AUTO) Off --- Fan operate mode (Fan ON)

I001711

5.5 Control Specifications

(1) Fan control

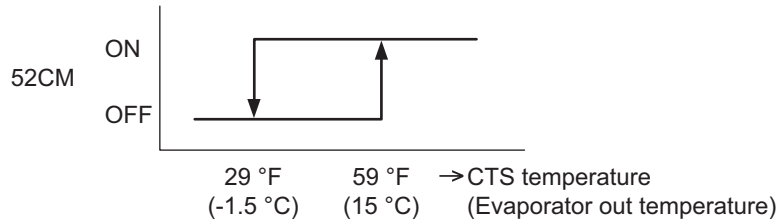
- When the FAN button is pressed, the 52ID (fan motor on/off) relay on the relay board turns on, operating the fan.
- For the Classic18, the 52ID relay turns the auxiliary relay on to operate the fan.
  - 52ID (Fan motor On-Off) relay output specification: 5 A at AC250 V

(2) Compressor start control

- When the ON/OFF button is pressed, the 52CM relay on the relay board turns on, operating the compressor.
  - 52CM (Compressor On-Off) relay output specification: 20 A at AC250 V

(3) Anti-freeze control

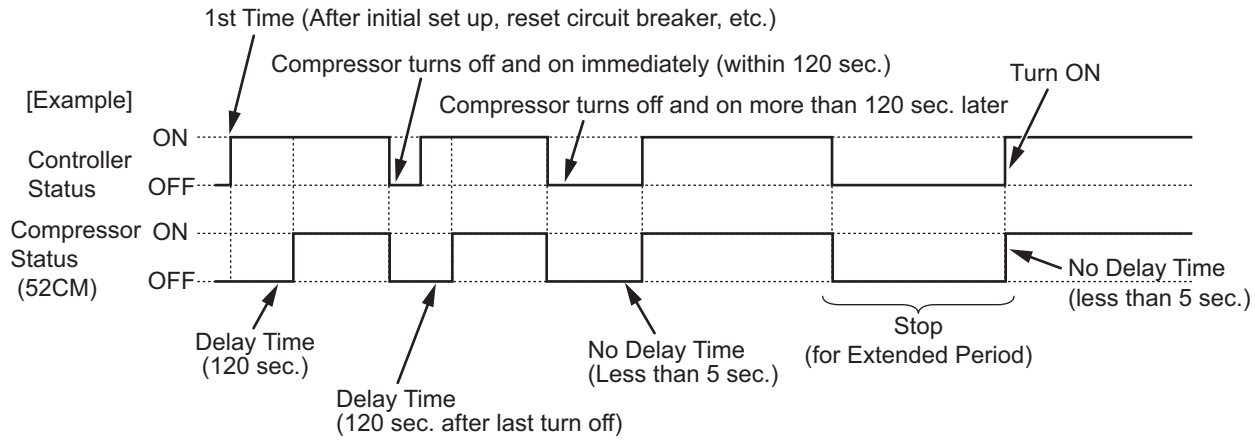
- Anti-freeze controls turns the compressor on and off by turning the 52CM relay on in accordance with the freeze protection thermistor (CTS) temperature. As a result, decreases in cooling performance due to frost buildup on the evaporator are prevented.
- Compressor off conditions: Freeze protection thermistor (CTS) temperature ≤ 29 °F (-1.5 °C)
- Compressor on (recovery) conditions: CTS temperature ≥ 59 °F (15 °C)



I001687

(4) Compressor time delay control (compressor protection)

- Compressor protection consists of a time delay program within the microprocessor. This program prevents a heavy load from being applied to the compressor motor when restarting the unit (cool mode) after a very short period of time. This “delay” is in effect any time the compressor is turned on by either the COOL ON/OFF button, or power interruption restart (automatic recovery.)
  - Time Delay Program Specifications: 120 sec.


1st Time (After initial set up, reset circuit breaker, etc.)
Compressor turns off and on immediately (within 120 sec.)
Compressor turns off and on more than 120 sec. later
Turn ON
[Example]
Controller Status
ON
OFF
Compressor Status (52CM)
ON
OFF
No Delay Time (less than 5 sec.)
Delay Time (120 sec.)
Delay Time (120 sec. after last turn off)
No Delay Time (Less than 5 sec.)
Stop (for Extended Period)

Reference: Initial turn on

Within: 120 sec. after (the power cord is connected to) the power supply, the compressor will start with delay timer.
After: 120 sec. since (the power cord was connected to) the power supply, the compressor will start without delay timer.

I001688

(5) Automatic restart and recovery function

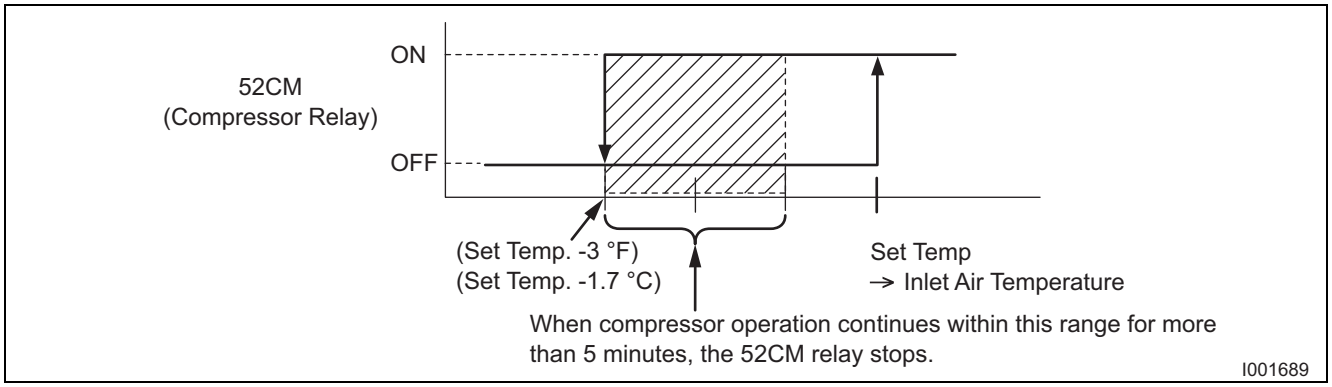
- The microprocessor contains a feature that automatically restart the unit after power is lost and regained, and also has memory to store and recover operation status in the even of a power loss.

Status of memory during power interruption

- When the input power is off, the status items below are saved in the memory.
  - Running status (on or off)
  - Operating mode: Cool mode or fan only mode
  - Set temperature
  - Temperature mode (°F or °C)
  - Fan mode: Fan operation mode (fan on) or fan stop mode (fan auto)

(6) Temperature control

• During cool mode, temperature control changes the 52CM (compressor on/off) relay status according to RTS temperature in the available range (-4 to 140 °F (-20 to 60 °C)).

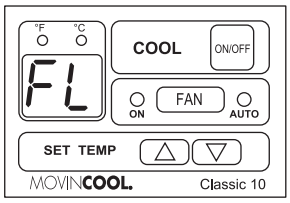
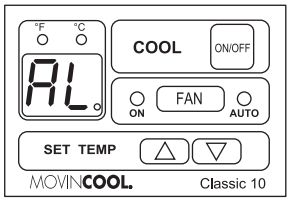
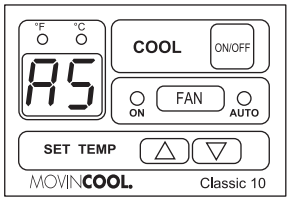
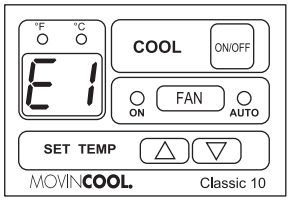
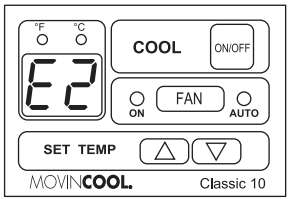


(7) Fire alarm signal control

• When receiving the signal from the fire alarm control panel, the buzzer sounds, and the 52CT (signal output) relay on the relay board turns on.

5.6 Self-Diagnostic Codes

• Self-diagnostic codes are displayed on the control board under the following conditions.

	Indication	Condition	Output Signal	Buzzer (On Board)
No. 1		When the drain tank switch is activated, the LED displays “FL” and the unit turns off automatically. Once emptying the drain tank procedure is completed and ON/OFF has been pushed, unit returns to normal operation.	Yes	No
No. 2		When the fire alarm control panel input signal is CLOSED, the unit turns off, the LED displays “AL”, and the buzzer turns on. This condition returns to normal when the input signal is once again OPEN, and unit has been RESET. To RESET, hold down the SET TEMP buttons (△/▽) simultaneously for 3 seconds, and the controller returns to normal status.	Yes	Yes
No. 3		Improper hose connection (including kink or blockage) or a defect in the condensate pump for more than 180 seconds will display "AS" on the LED resulting the compressor to stop immediately; however, fan will continue to operate. Normal condition is resumed when condensate pump or hose connection is fixed, and the unit has been RESET. To RESET, hold down the SET TEMP buttons (△/▽) simultaneously for 3 seconds, and the controller returns to normal status.	Yes	No
No. 4		When room thermistor becomes open or shorted, display shows “E1” and cool mode operation is off. Display and cool mode operation are returned to normal operation after condition is corrected.	Yes	No
No. 5		When freeze protection thermistor becomes open or shorted, display shows “E2” and cool mode operation is off. Display and cool mode operation are returned to normal operation after condition is corrected.	Yes	No

I001712

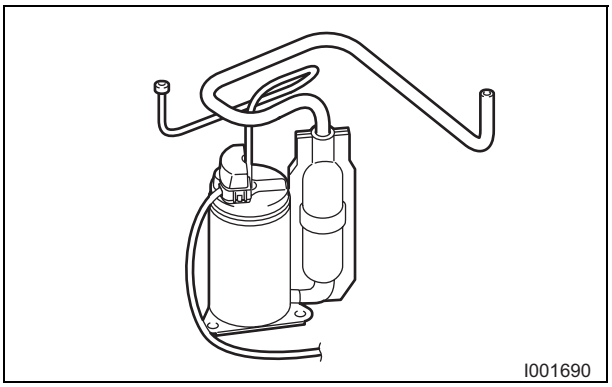
5.7 Compressor

(1) Compressor motor

- The compressor motor is a single-phase motor and is contained within the same housing as the compressor.

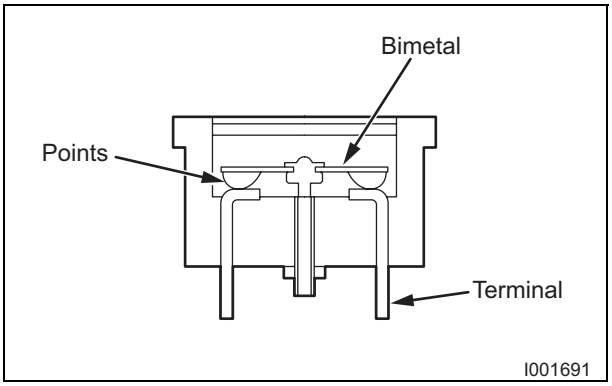
Specifications: Classic10
- Rated Voltage: 115 V
- Rated Output: 600 W

Specifications: Classic18
- Rated Voltage: 208/230 V
- Rated Output: 1100 W



(2) Compressor overload relay

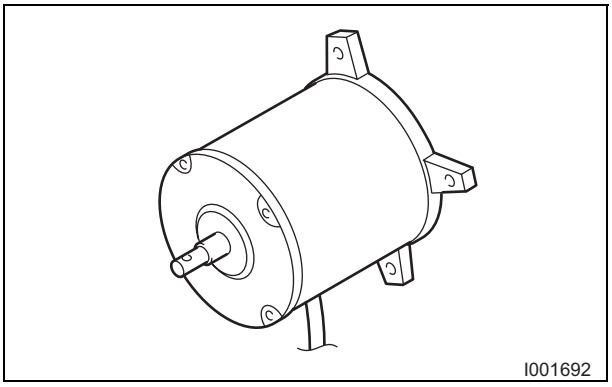
- An external compressor overload relay is used to protect the compressor motor. This relay is mounted within the connector housing that attaches to the top of the compressor. The relay interrupts the flow of current when there is an overload condition and, high temperature builds up in the compressor.



Model	Operating Temperature		Non-Operating Limit at 176 °F (80 °C) (A)	Marking
	OFF (Open Contacts)	ON (Closed Contacts)		
Classic10	275 °F (135 °C)	156 °F (69 °C)	10.0	MST00AGU-9014
Classic18	293 °F (145 °C)	156 °F (69 °C)	13.0	MRA98869

5.8 Fan Motor

- The fan motor is a single phase, induction type. The motor rotates the fan on both the evaporator side and the condenser side at the same time.
- The following table shows the specifications of the fan motor used for each model.


I001692

Specifications:

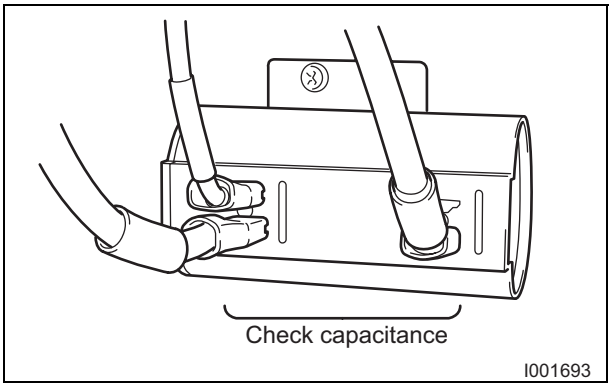
	Classic10	Classic18
Rated Voltage	115 V 60 Hz	208/230 V 60 Hz
Rated Output	140 W	350 W

< NOTE >

An internal overload relay is used to protect the fan motor. This relay is built into the fan motor and interrupts the flow of current when there is an over current situation, or if abnormally high temperature builds up in the fan motor.

5.9 Capacitor

- The capacitor is used to improve the rotational power of the fan motor and compressor at startup. The specification for each capacitor is shown below.



I001693

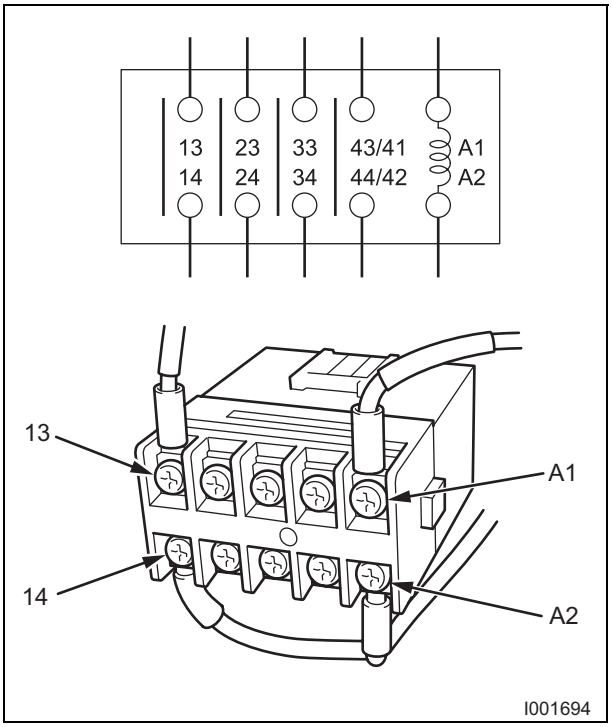
Model	Capacitor	Rated Voltage (V)	Capacitance (μF)
Classic10	For Fan Motor	200	16
	For Compressor	370	25
Classic18	For Fan Motor	400	10
	For Compressor	370	25

5.10 Auxiliary Relay (For Classic18 Only)

- The auxiliary relay is normally closed when the unit is in operation (fan or cool), and supplies power to the fan motor.
- When current flows across A1 and A2, terminals 13 and 14, 23 and 24, 33 and 34, 43/41 and 44/42 conduct.

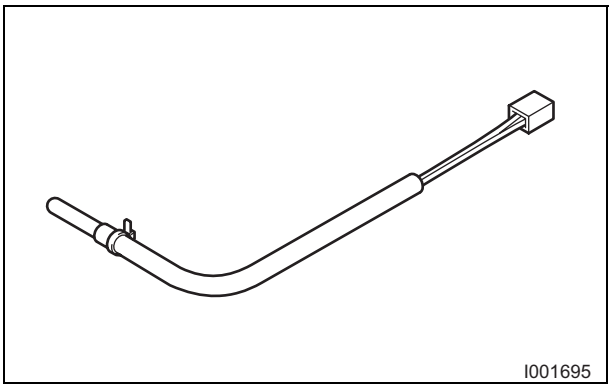
Specifications:

- Rated Voltage: AC230 V
- Rated Current: 10 amps



5.11 Temperature Thermistor

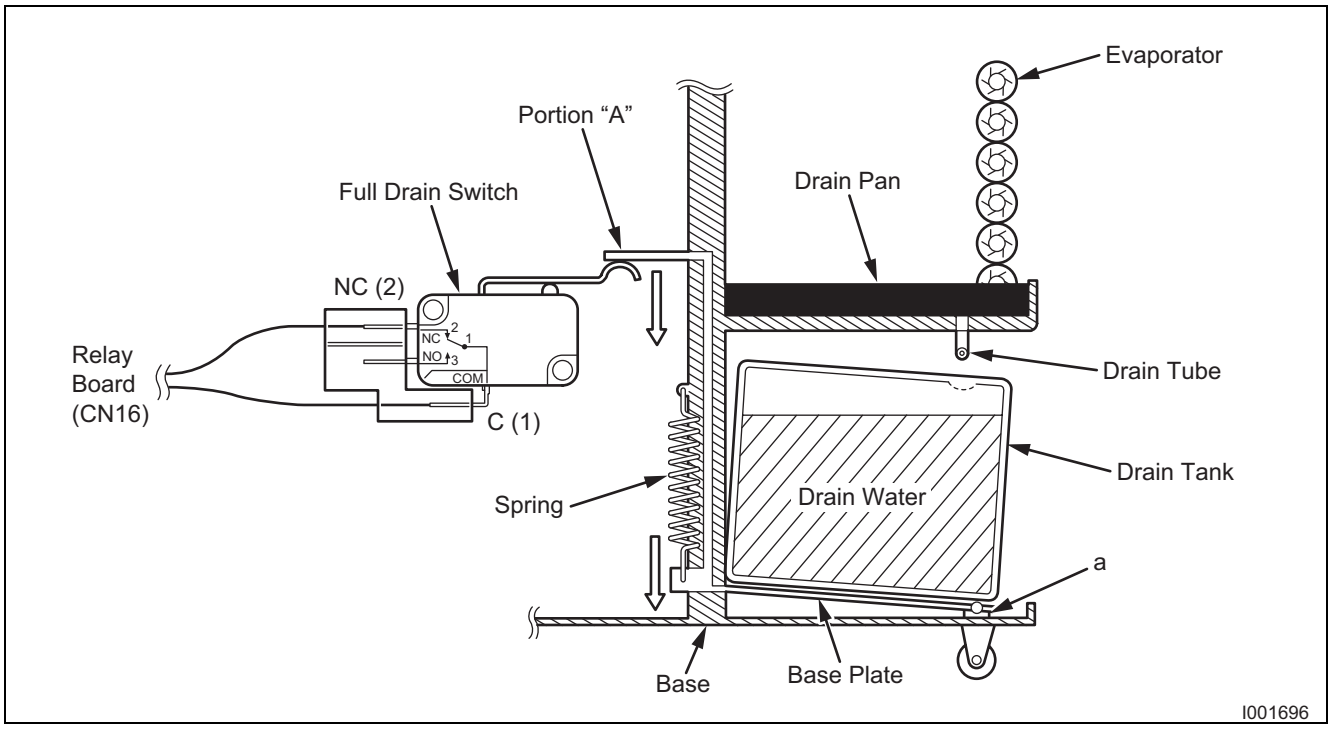
- The room thermistor (RTS) is installed upstream of the evaporator, and detects evaporator inlet temperature as a resistance value.
- The freeze protection thermistor (CTS) is installed in the evaporator outlet piping, and detects low temperature on the evaporator as a resistance value.



Type	Specification		
	Characteristic	"Short" Detection	"Open" Detection
Room Thermistor (RTS)	5k Ω at 77 °F (25 °C) B=3,970 K	181 °F (83 °C) or more	-29 °F (-34 °C) or less
Freeze Protection Thermistor (CTS)	5k Ω at 77 °F (25 °C) B=3,970 K	181 °F (83 °C) or more	-29 °F (-34 °C) or less

5.12 Drain Tank Switch

- The drain switch activates and stop the operation of compressor motor and fan motor when approximately 4.4 gal (16 L) of drain water accumulates in the drain tank. At the same time, control panel display "FL", and compressor and fan operations stop. This system uses a 250 V, 0.1 A rating micro switch for this function.
- When approximately 4.4 gal (16 L) of drain water accumulates in the drain tank, the drain tank base plate, which is supported at fulcrum (a), is pushed down in the direction of the arrow.
- When the drain tank base plate is forced down, “portion A”, located at the top of the drain tank base plate, turns off micro switch contacts (1)-(2).



6. PRECAUTIONS FOR SAFETY

6.1 Definition of Terms

⚠ **WARNING**	Describes precautions that should be observed in order to prevent injury to the user during installation or unit operation.
⚠ **CAUTION**	Describes precautions that should be observed in order to prevent damage to the unit or its components, which may occur during installation or unit operation if sufficient care is not taken.
NOTE	Provides additional information that facilitates installation or unit operation.

6.2 General Precautions

⚠ WARNING

- **When necessary, electrical work should only be performed by qualified electrical personnel. Repair to electrical components by non-certified technicians may result in personal injury and/or damage to the unit. All electrical components replaced must be genuine MovinCool parts, purchased from an authorized reseller.**
- **When handling refrigerant, always wear proper eye protection and do not allow the refrigerant to come in contact with your skin.**
- **Do not expose refrigerant to an open flame.**
- **The proper electrical outlet for MovinCool units must be equipped with a "UL" approved ground-fault breaker to prevent electrical shock from the unit.**
- **When brazing any tubing, always wear eye protection, and work only in a well ventilated area.**

7. TROUBLESHOOTING

7.1 Troubleshooting

- To accurately troubleshoot the problem, it is important to carefully confirm the nature of the problem.

  Typical problems are:

  - Insufficient cooling
  - Unit does not start (operate)
  - Drain water overflow
  - Abnormal noise or vibration
  - Other

(1) Insufficient cooling

- Cooling system problem generally results from electrical or mechanical components such as fan motor, compressor, or control switch.

< NOTE >

- There is a possibility that insufficient cooling is caused by air filter clogging. First, verify that the air filter is not clogged.
- Check the power supply due to the possibility of a power source failure.

Symptom		Possible Cause		Remedy
		Check Area	Cause	
Air Volume Normal	Compressor Operates	1. Usage conditions (high temperature)	Operation near usage limits	Review the installation place.
		2. Dirt in condenser or evaporator	Poor heat exchange	Clean fins.
		3. Frost in refrigeration cycle	Clogging at the frost section	Replace clogged section.
		4. No temperature difference between evaporator and condenser	Insufficient refrigerant	Check the leaking part, then repair and charge refrigerant.
	Compressor Does Not Operate	1. Coil resistance (0 Ω or ∞ Ω)	Short or open circuit	Replace compressor. (In case of short, check the compressor relay on the relay board)
		2. Compressor on/off relay (52CM) on the relay board	Open circuit or poor contact	Replace relay board.
		3. Capacitor for compressor	Capacitor malfunction	Replace capacitor.
		4. Compressor overload relay	Overload relay fault	Replace overload relay.
		5. Voltage	Low voltage	Repair power.
Insufficient Air Volume	No Air	1. Coil resistance of fan motor (0 Ω or ∞ Ω)	Short or open circuit	Replace fan motor.
		2. Fan motor on-off relay (52ID) on the relay board	Open circuit or poor contact	Replace relay board.
		3. Auxiliary relay in the control box (Classic18 only)	Open circuit or poor contact	Replace auxiliary relay.
			No excite coil on the relay (no voltage)	Check and replace relay board.
	Insufficient Air Volume	1. Air filter	Clogged air filter	Clean air filter.
		2. Evaporator	Clogged evaporator or crushed fins	Repair and clean fins, or replace.
		3. Duct connection state	Improper connection	Repair duct connection.
		4. Fan motor	Poor rotation	Replace motor.

(2) Unit does not start (operate)

< NOTE >

- In this case, there is a possibility of safety device activating due to the clogged air filter. So be sure to first clean the air filter and then start up again to confirm if the problem lies with the air filter.
- Check the installation site for operating temperature and installation space (unobstructed airflow).
- In the case above, there is the possibility of a safety device activating due to a clogged air filter. First clean the air filter and then verify that the unit starts.

Symptom		Possible Cause		Remedy
		Check Area	Cause	
Does Not Operate at All	LED Display Turns Off	1. Voltage	Power failure	Repair power supply.
		2. Ground fault breaker trip	Ground fault or defective ground fault	Repair ground fault section.
				Reset or repair breaker.
		3. LCDI power cord trip	LCDI power cord trip	Reset power cord.
				Replace power cord.
		4. Fuse	Fuse blown	Repair shorting section. Replace fuse.
LED Display Turns On	Display Shows Error Codes	1. Display code “FL”	Drain tank is filled with drain water	Discharge the drain water.
		2. Display code "AS"	Improper routing of drain hose	Repair drain hose, then reset unit.
			Defective condensate pump	Repair or replace condensate pump, then reset unit.
			Missing jumper connector	Connect jumper connector.
		3. Display code “AL” with beep sound	Input signal (from fire alarm) continuously	Check external input signal, then reset unit.
		4. Display code “AL” without beep sound	Input signal (from fire alarm) on from before	Reset unit.
		5. Display code "E1"	Improper room thermistor connection	Check connection.
			Defective room thermistor	Replace room thermistor.
		6. Display code "E2"	Improper freeze protection thermistor connection	Check connection.
			Defective freeze protection thermistor	Replace freeze protection thermistor.
Stops Immediately	LED Displays Normally	1. Fan motor on/off relay (52ID) on the relay board	Open circuit or poor contact	Replace relay board.
		2. Fan motor insulation resistance	Insulation failure on fan motor	Replace fan motor.
Stops after Running a While	LED Displays Normally	1. Coil resistance of fan motor	Defective fan motor	Replace fan motor.
		2. Compressor temperature (abnormally high)	Compressor overload relay operates due to compressor malfunction	Replace compressor. Service dirty areas.
			Insufficient refrigerant or gas leakage	Repair and charge refrigerant.
		3. Dirt on air filter or condenser	Insufficient condenser cooling	Clean condenser.

(3) Drain water overflow

Symptom	Possible Cause		Remedy
	Check Area	Cause	
Overflow from Unit	1. Drain pan	Cracks in drain pan	Check and repair.
	2. Water level in drain pan	Clogged drain hose	Check and replace.
	3. Drain hole	Reversed air flow from drain hole	Insert a trap on the discharge drain hose.
	4. Clogged air filter	Reversed air flow from drain hole due to the excessive negative pressure inside of the unit	Clean air filter.

(4) Abnormal noise or vibration

- To prevent from abnormal noise or vibration, first carefully determine the source. Next, devise proper countermeasures to eliminate the noise or vibration and prevent reoccurrence.

Symptom	Possible Cause		Remedy
	Check Area	Cause	
Abnormal Noise or Vibration.	1. Fan	Fan interference	Repair interfering section.
		Fan deformation	Replace fan.
	2. Compressor fixing nuts	Looseness of nuts	Tighten nuts further.
	3. Piping	Pipe interference	Repair interfering section.
	4. Panel fixing screws	Looseness of screws	Tighten screws further.

7.2 Basic Inspection

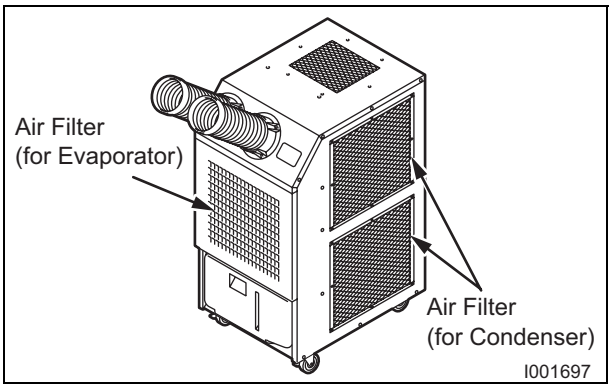
- Perform the following inspections before disassembly.

(1) Power source voltage inspection

- Check the power supply voltage.
  - Classic10: Single phase 115 V (60 Hz)
  - Classic18: Single phase 208/230 V (60 Hz)
- Check the operation and condition of the fuse or circuit breaker for the power source.

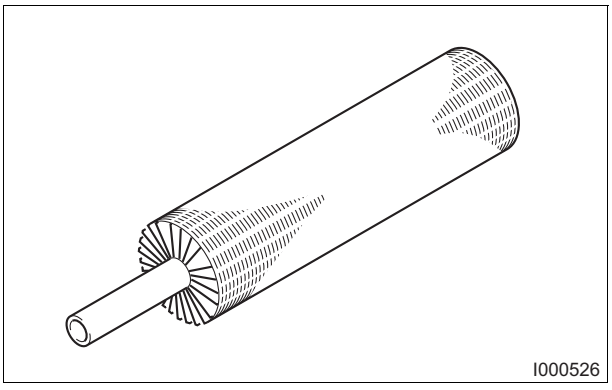
(2) Air filter inspection

- Remove the air filters and check the element. If dirty, wash the element.



(3) Fin inspection

- Remove the air filters and inspect the spine fins for any dirt, dust, lint, or debris that may cause poor cooling performance. If spine fin cleaning is necessary, it is recommended that this service be performed by a qualified service technician.



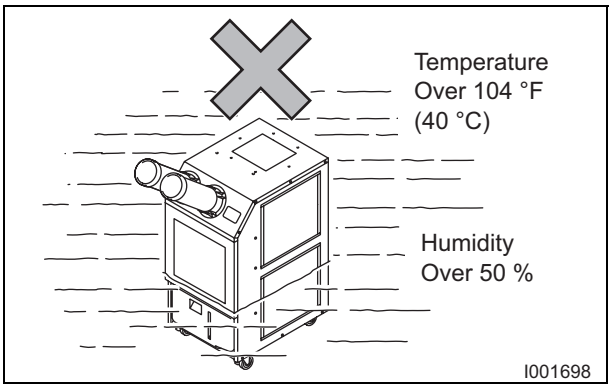
(4) Operating environment inspection

- Check the environment around the unit.

  Inlet air:

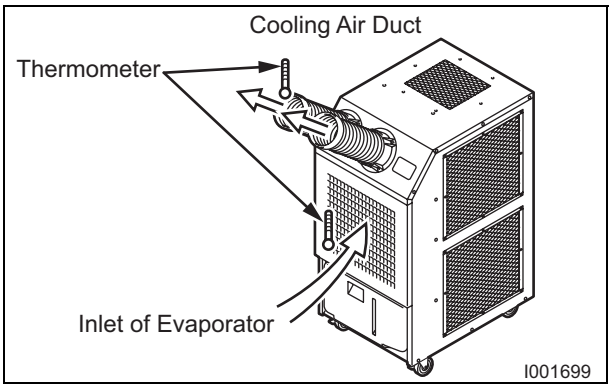
  - Temperature 104 °F (40°C) or lower Humidity 50 % or lower

- Do not operate the unit above the temperature and humidity specified above.



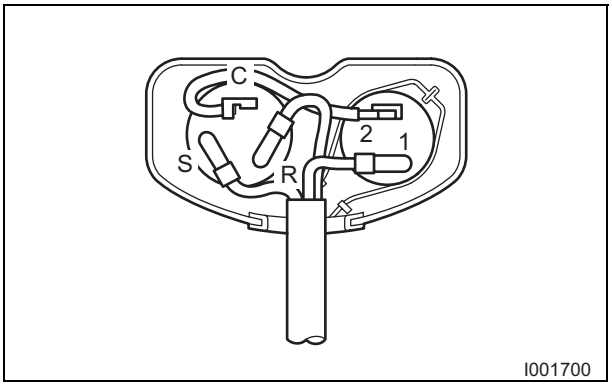
(5) Cooling capacity inspection

- Measure the temperature difference between the evaporator inlet and the cooling air duct outlet. If the difference is out of the range shown in the graphs on page 10, proceed with the remedy suggested in the troubleshooting chart on page 37.



7.3 Compressor Inspection

(1) Compressor motor inspection

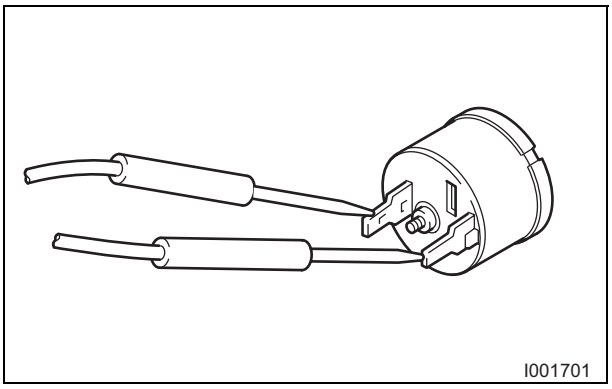


- Measure resistance across the terminals of the compressor motor.

Model	Resistance at 77 °F (25 °C)	
	R-C	C-S
Classic10	Approx. 0.7 Ω	Approx. 9.2 Ω
Classic18	Approx. 1.5 Ω	Approx. 4.0 Ω

- If the measured resistance is not equal to the standard values listed above, replace the compressor. The compressor has an external overload relay. The overload relay should be operational if the above resistance is obtained under normal temperature. For overload relay specifications, refer to the chart below.

(2) Overlord relay inspection

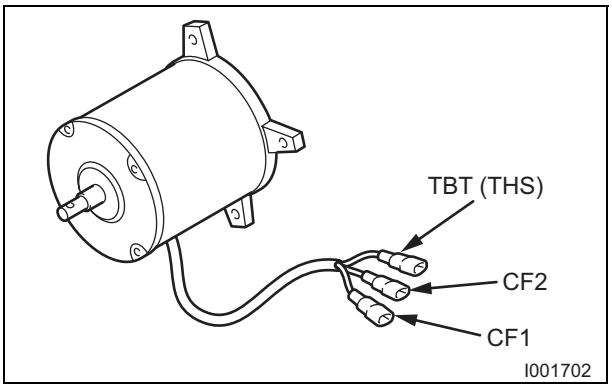


- Check for continuity across two terminals of the overload relay. At normal temperature, there should be continuity across the terminals.

Model	Operating Temperature	
	OFF (open contacts)	ON (closed contacts)
Classic10	275 °F (135 °C)	156 °F (69 °C)
Classic18	293 °F (145 °C)	156 °F (69 °C)

- If there is no continuity across the terminals, replace the overload relay.

7.4 Fan Motor Inspection



- Measure resistance across the terminals of the fan motor.

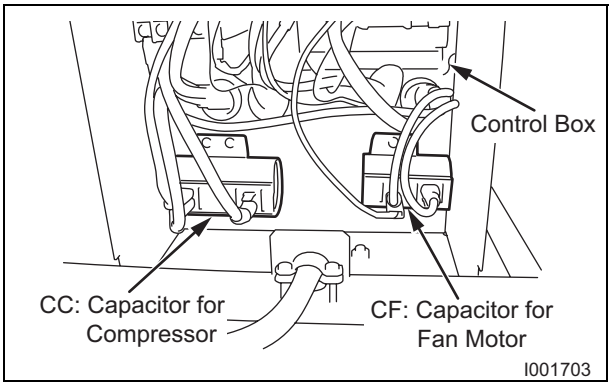
Model	Resistance at 68 °F (20 °C)	
	CF1-TBT	CF2-TBT
Classic10	Approx. 7 Ω	Approx. 9 Ω
Classic18	Approx.14.4 Ω	Approx. 12 Ω

- If the measured resistance is not equal to the standard values listed above, replace the fan motor.

7.5 Capacitor Inspection (For Fan Motor and Compressor)

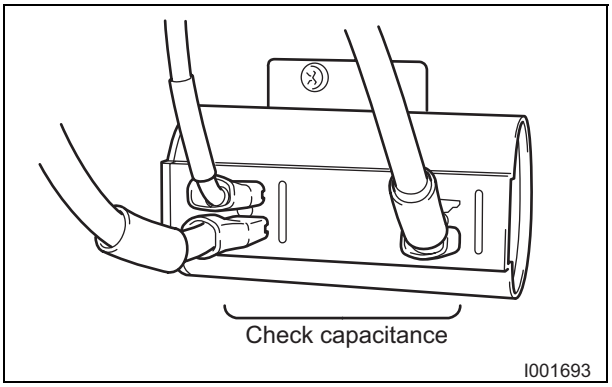
(1) Ohmmeter method

- Set the ohmmeter to the 10 MΩ range. Place the two probes against the two terminals of the capacitor. At first, the ohmmeter indicates small value, then the reading should gradually increase towards infinity (∞), indicating that the capacitor is charging. If the reading indicates infinity immediately (open), or the ohmmeter fails to move from 0 Ω (shorted), replace the capacitor.



(2) Capacitance tester method

- Use a capacitance tester to check the capacitor for the values indicated below. If the value tested is not within 10 % of the indicated capacitance, replace the capacitor.



Model	Capacitor	Rated Voltage (V)	Capacitance (μF)
Classic10	For Fan Motor	400	10
	For Compressor	370	25
Classic18	For Fan Motor	200	16
	For Compressor	370	25

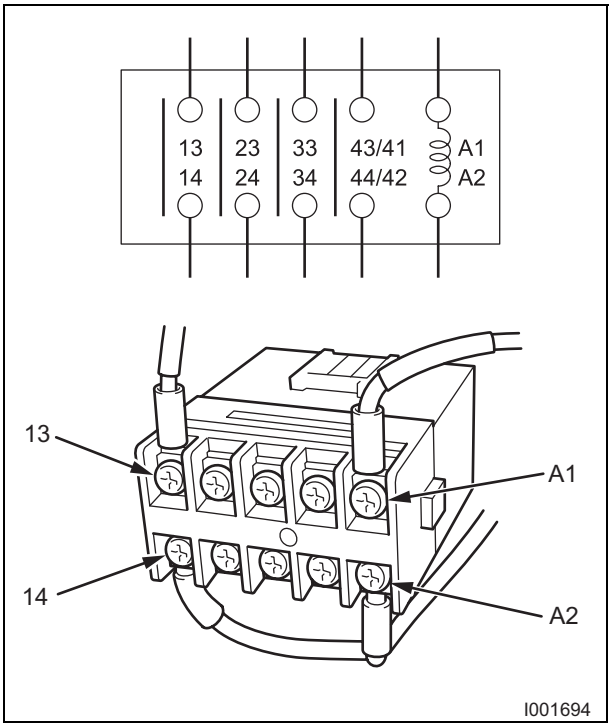
⚠ WARNING

Properly discharge the capacitor(s) before and after testing. Failure to discharge the capacitor may cause damage to the test equipment and/or unit, and result in personal injury (electrical shock) or death.

7.6 Auxiliary Relay Inspection (For Classic18 Only)

- Measure the resistance across terminals A1 and A2.
  - Standard resistance: 1.6 ~ 2.4k Ω
- If the resistance is out of the range specified above, replace the auxiliary relay.

- Check the continuity across the terminals 13 and 14, when the test button is depressed as well as when released.



Terminals	State of Reset Switch	Continuity
13-14	Depressed	Continuity
	Released	No continuity

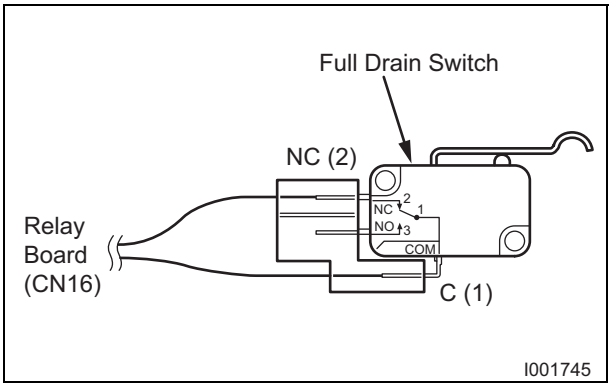
(Reference)

23-24	Depressed	Continuity
	Released	No continuity
33-34	Depressed	Continuity
	Released	No continuity
43/41-44/42	Depressed	Continuity
	Released	No continuity

7.7 Full Drain Switch Inspection

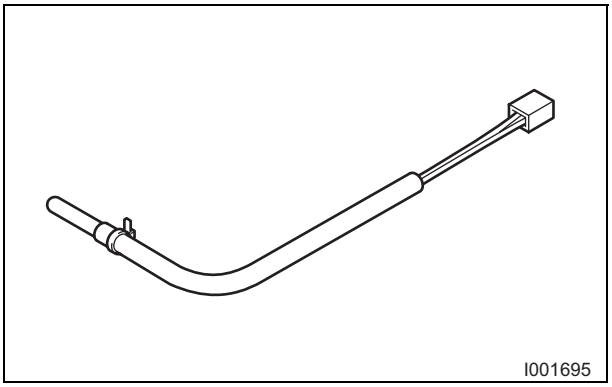
- Depress the full drain switch to check for continuity. If there is no continuity, replace the switch.

- Normally: Continuity across 1 and 2.
- Switch Depressed: Continuity across 1 and 3.



7.8 Thermistor Inspection

• Use an ohmmeter to check the resistance across the 2-pin connector at normal temperature (77 °F (25 °C)).



Type	Specification
	Characteristic
Room Thermistor (RTS)	5k Ω at 77 °F (25 °C) B=3,970 K
Freeze Protection Thermistor (CTS)	5k Ω at 77 °F (25 °C) B=3,970 K

7.9 Wiring Connection Inspection

• While referring to the wiring diagrams, check the connection of each wire.

⚠ CAUTION

Secure the wires using clamps to prevent contact with the edges of the structure, etc. Secure the wires in the same position as prior to removal.

7.10 Refrigerant System Inspection

• In most cases, the most probable causes of insufficient cooling are a clogged system, leakage, or an incorrect amount of refrigerant. In such cases, inspect the system according to the following procedure.

(1) System clog inspection

• Check refrigerant system components (including piping) that could be clogged with refrigerant. When a component is clogged with refrigerant, only the clogged part will be partially frosted. In such cases, replace the part in question.

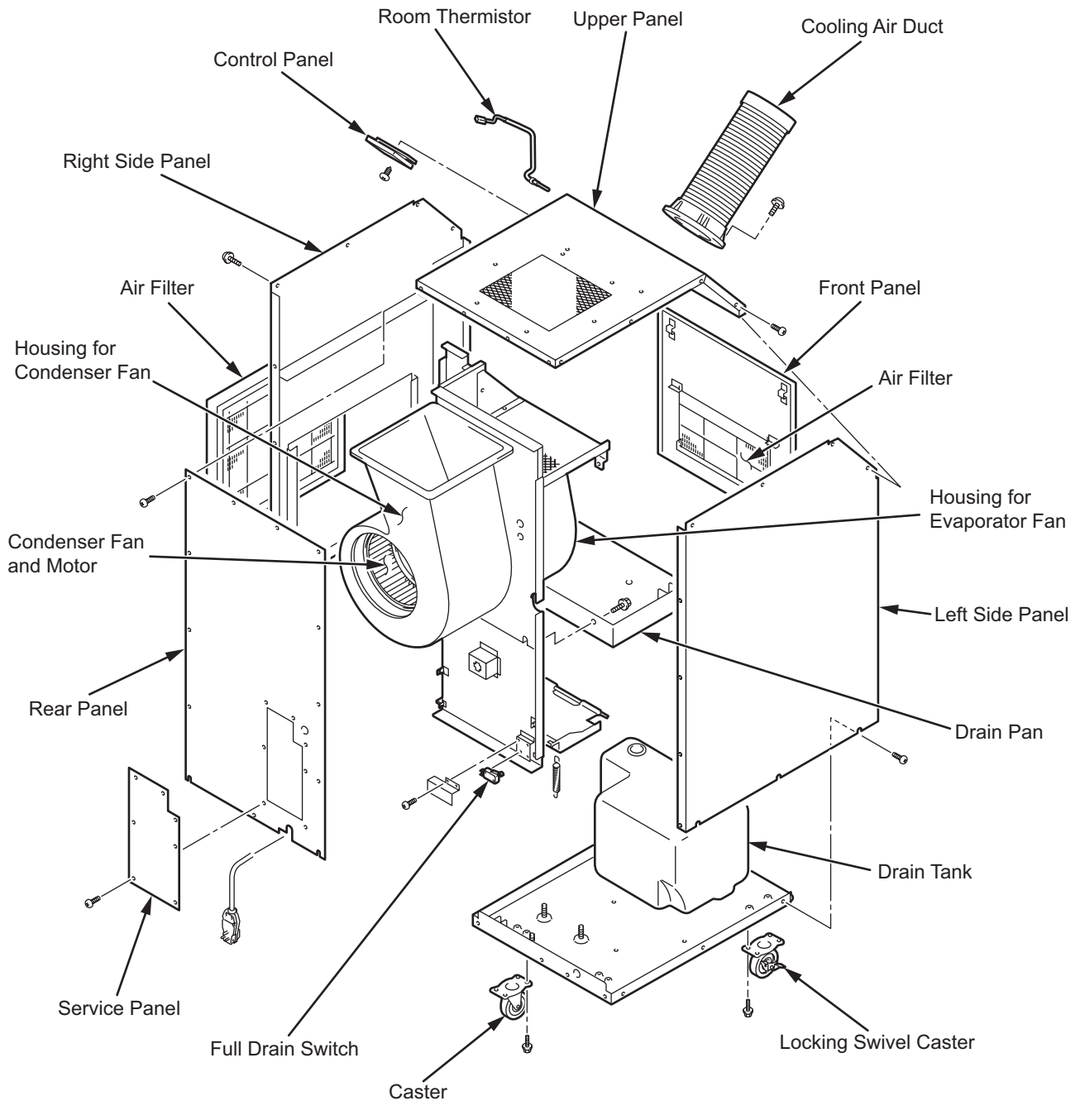
(2) Refrigerant leak inspection

• Each time the refrigerant system is installed or repaired, use an electronic gas leak tester to carefully check all connections, and each component for leaks.

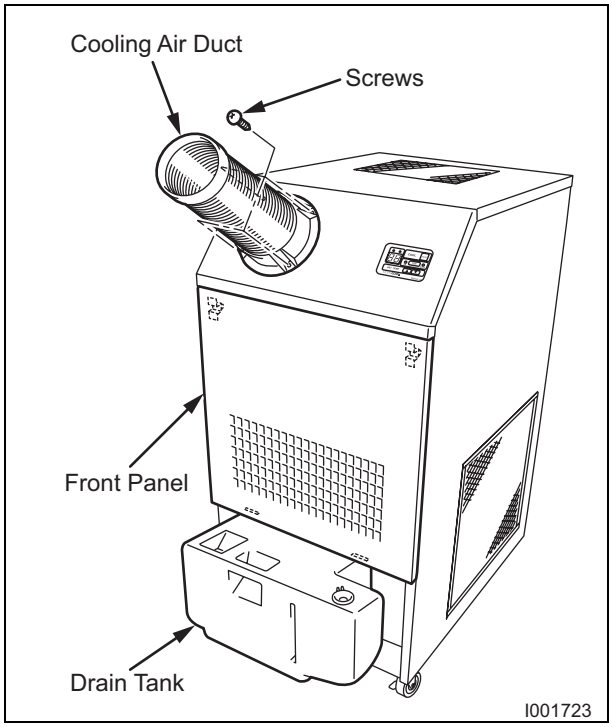
8. DISASSEMBLY (For Classic10)

8.1 Parts Construction

<Classic10>



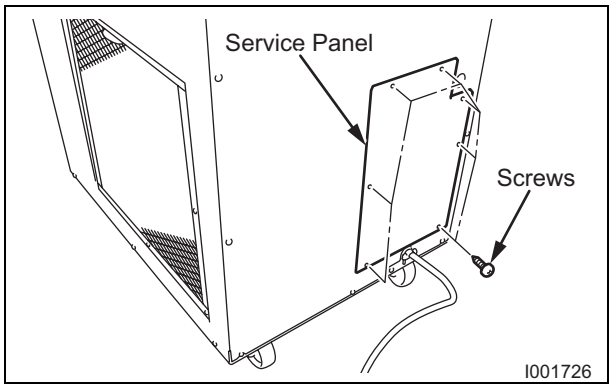
8.2 Disassembly



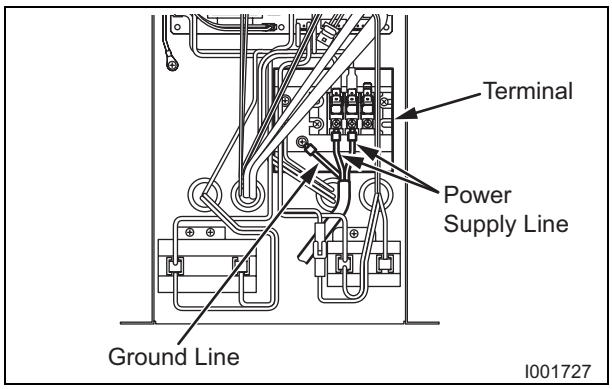
1) Remove the drain tank.

2) Unfasten the two clips and the lower-side hook, and then remove the front panel.

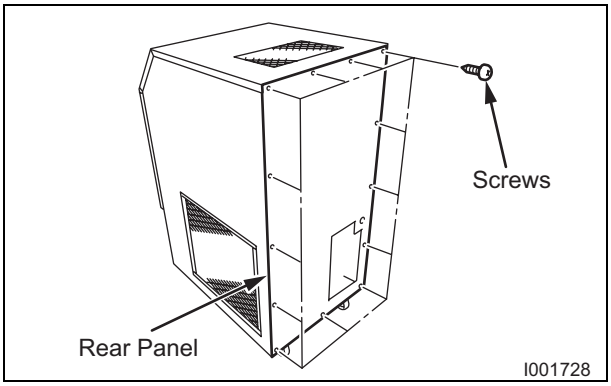
3) Take out the four screws, and then remove the cooling air duct.



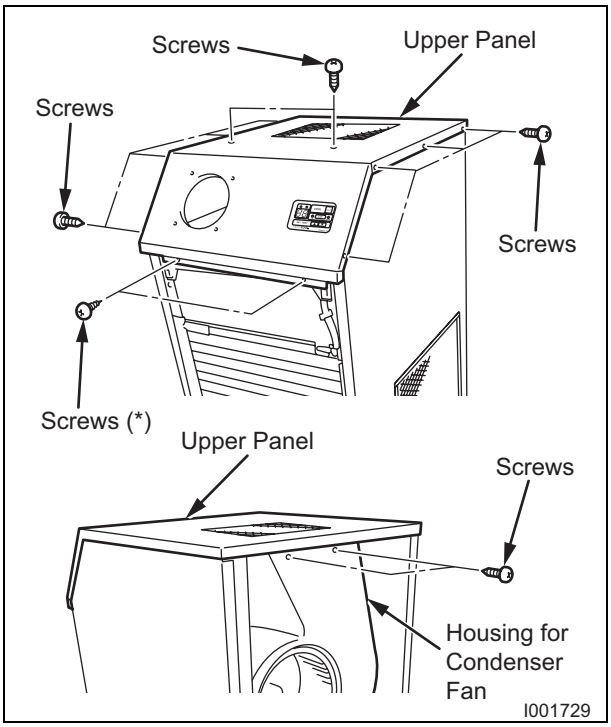
4) Take out the seven screws, and then remove the service panel.



5) Remove the two power supply lines from the terminal, and remove the ground wire.



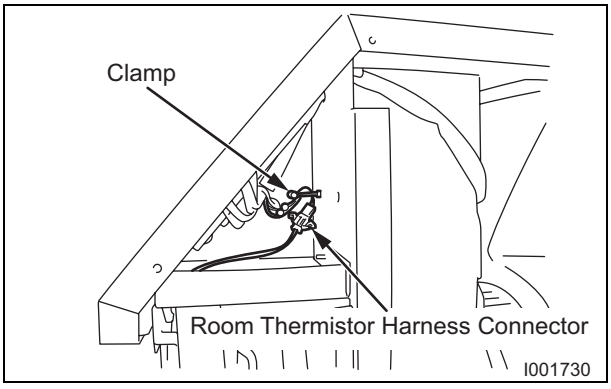
6) Take out the thirteen screws, and then remove the rear panel.



7) Take out the fourteen screws, and then remove the upper panel.

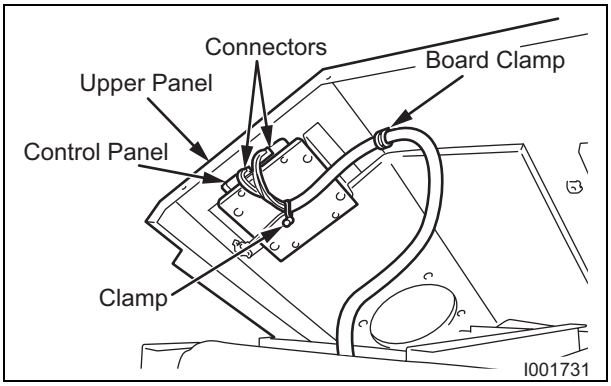
⚠ CAUTION

The two screws (*) used on the front side of the upper panel differ from the rest. Ensure that the correct screws are used when attaching the upper panel.



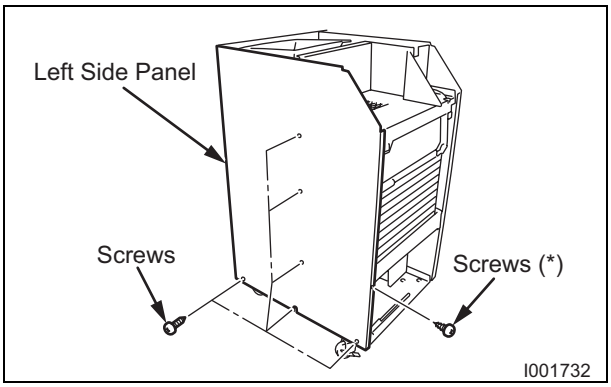
8) Unfasten the connector on the room thermistor wiring harness.

9) Remove the wiring harness from the clamp.



10) Unfasten the two connectors (11-pin, 5-pin) from the control panel.

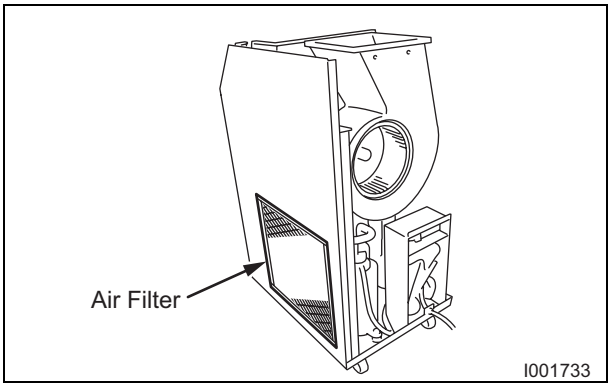
11) Remove the wiring harness from the clamp and board clamp.



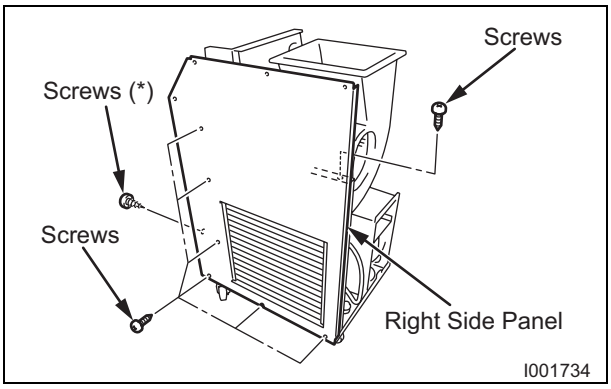
12) Take out the seven screws, and then remove the left-side panel.

⚠ CAUTION

The screw (*) on the front side of the left-side panel differs from the rest. Ensure that the correct screw is used when attaching the left-side panel.



13) Remove the air filter from the right-side panel.

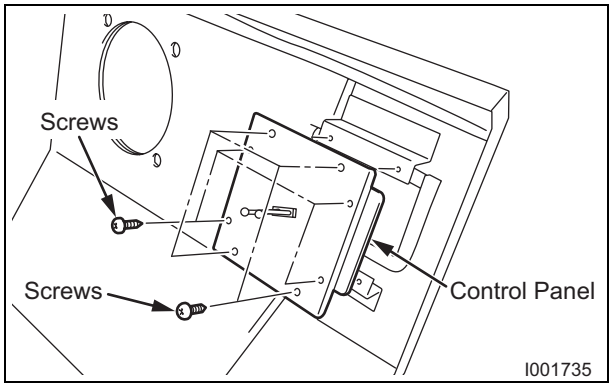


14) Take out the eight screws, and then remove the right-side panel.

⚠ CAUTION

The screw (*) on the front side of the right-side panel differs from the rest. Ensure that the correct screw is used when attaching the right-side panel.

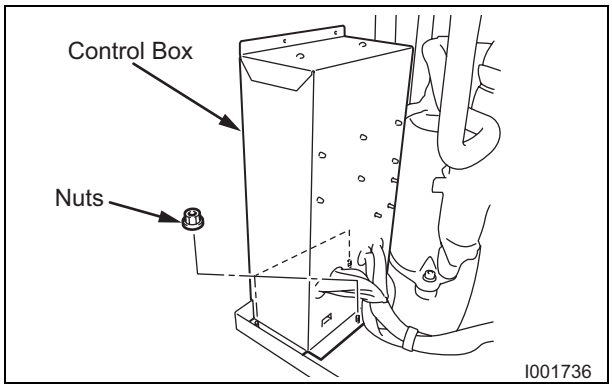
8.3 Control Panel Removal



1) Take out the eight screws, and then remove the control panel.

8.4 Electrical Components Removal

(1) Control box

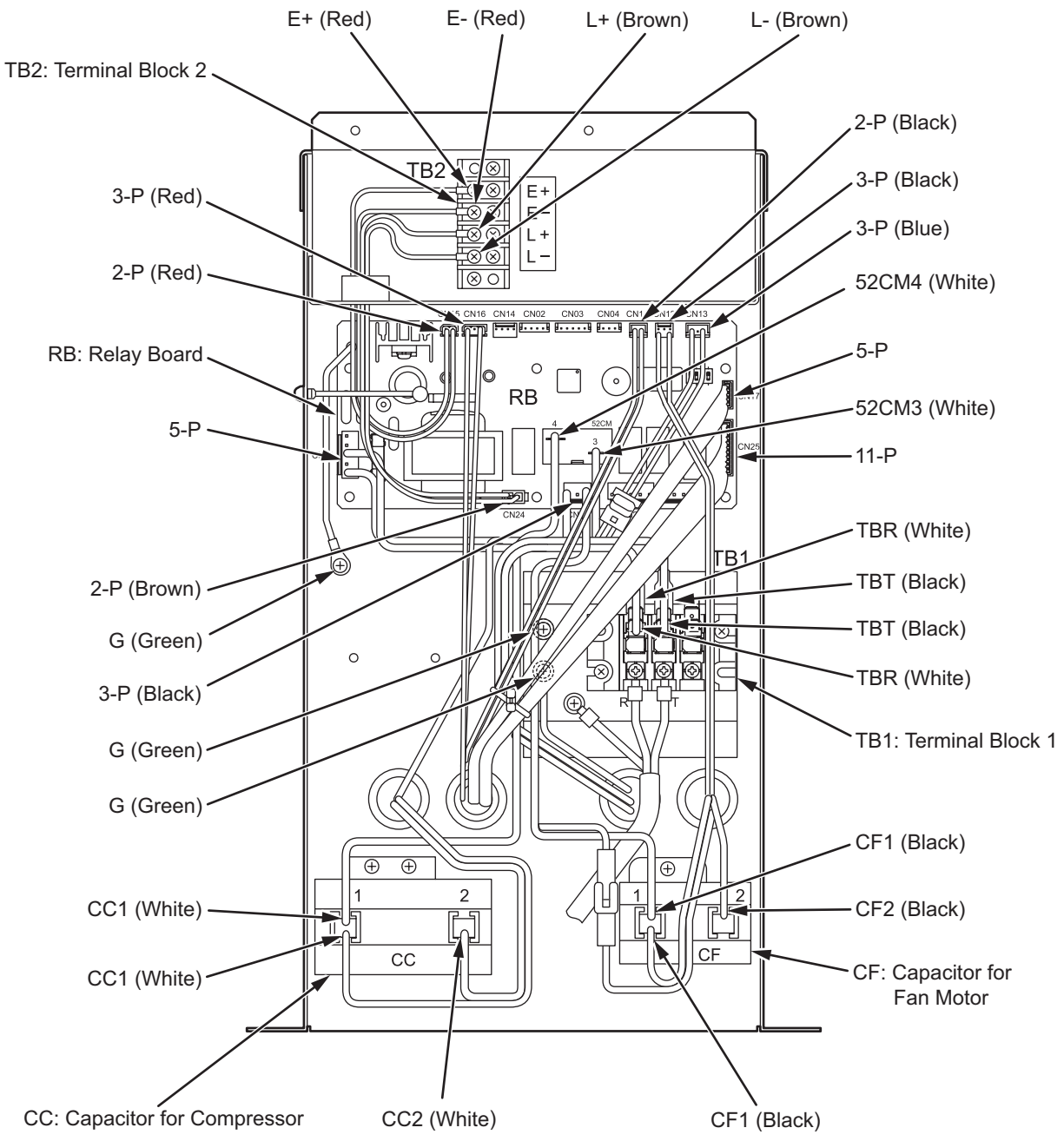


1) Take off the three nuts, and then remove the control box.

(2) Electrical parts and relay board removal

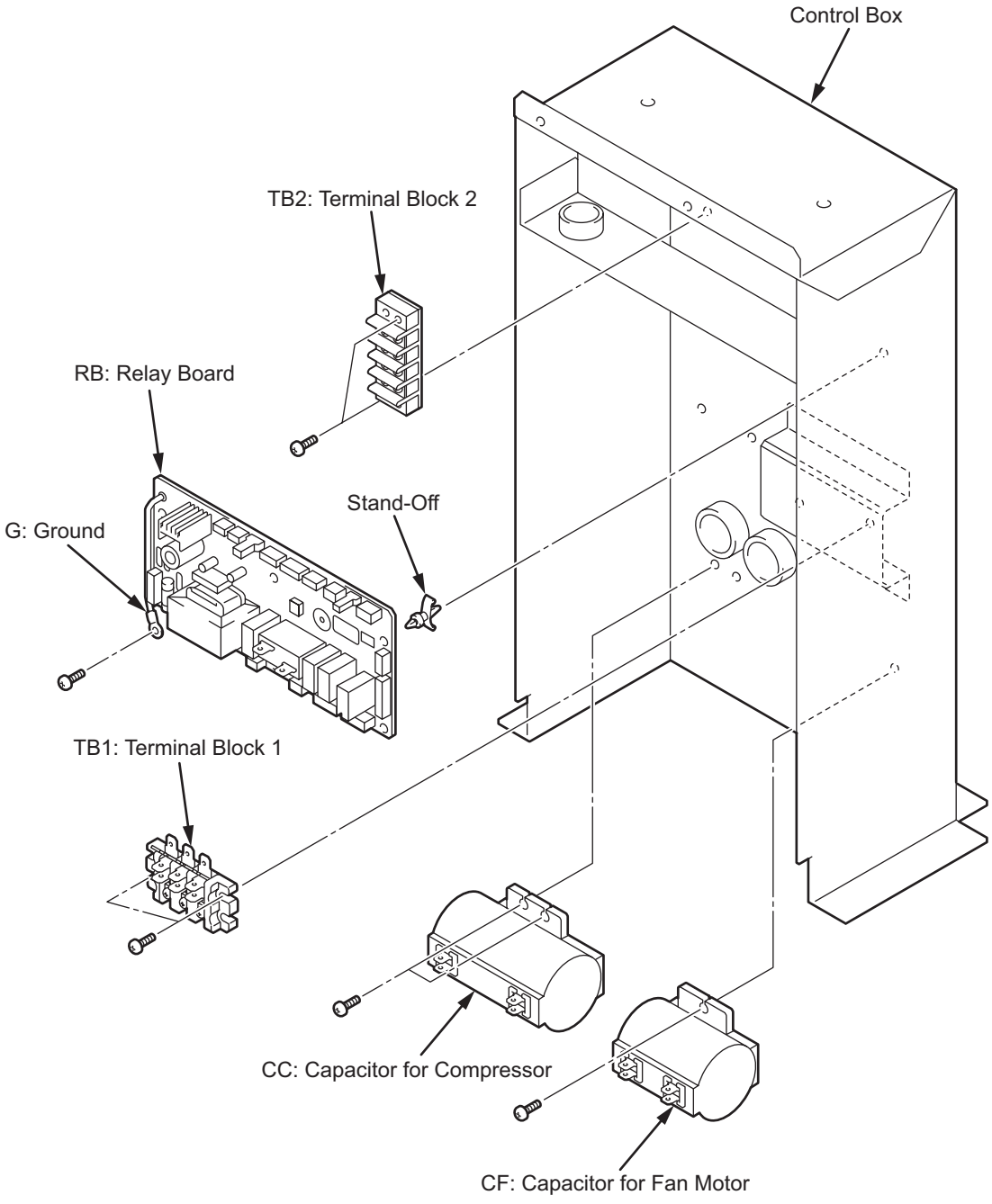
• Unfasten each connector, and then remove the electrical parts from the control box.

<Classic10>



I001721

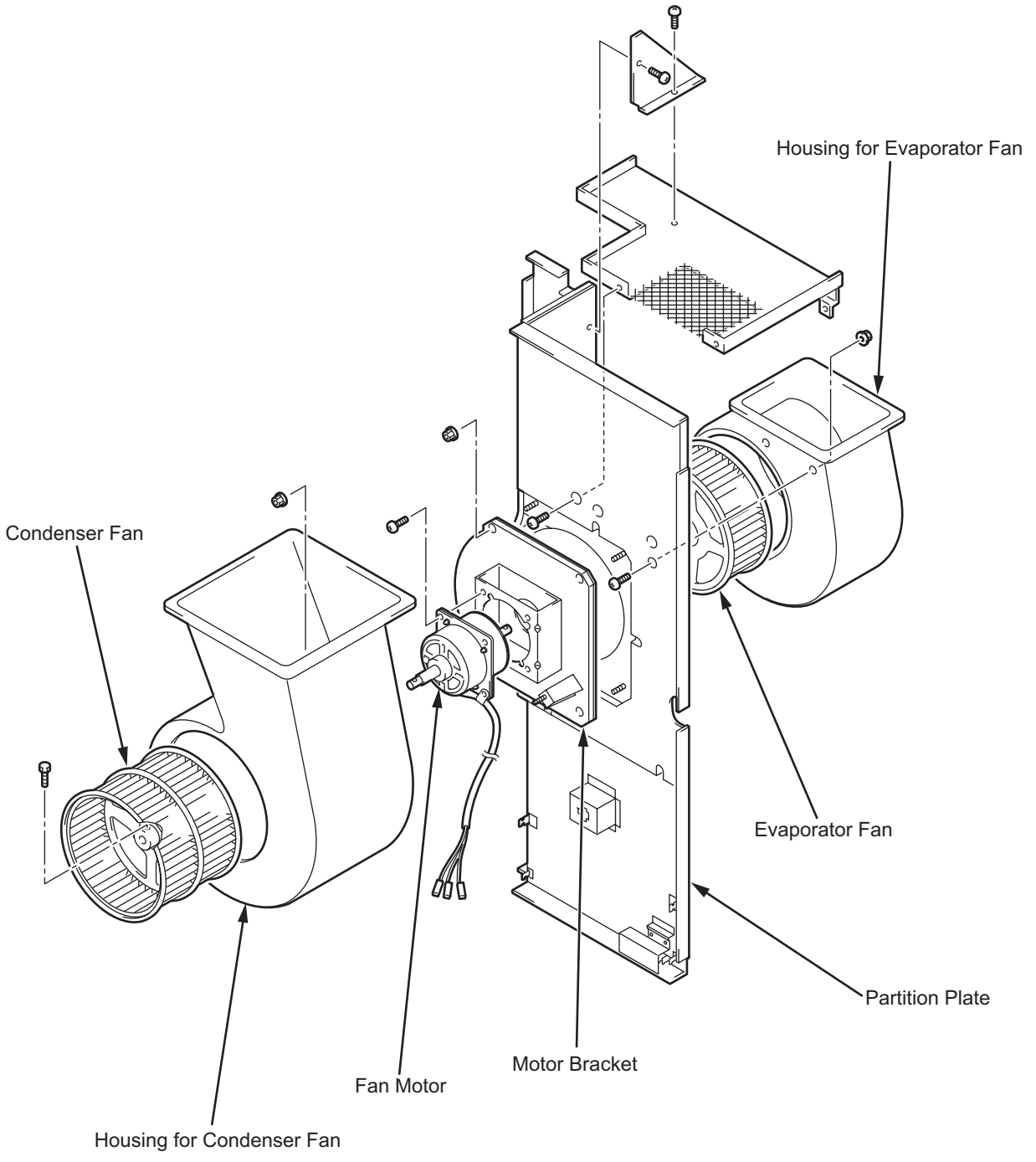
<Classic10>

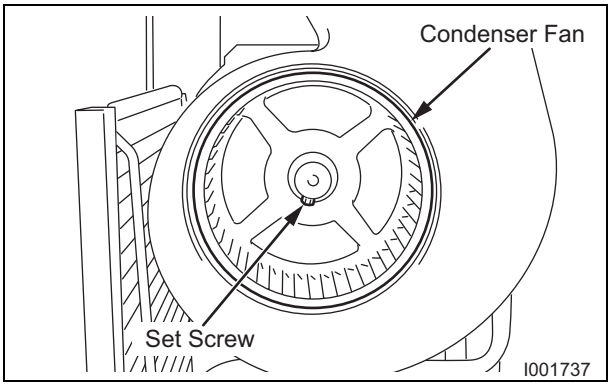

Control Box
TB2: Terminal Block 2
RB: Relay Board
Stand-Off
G: Ground
TB1: Terminal Block 1
CC: Capacitor for Compressor
CF: Capacitor for Fan Motor
I001719

8.5 Fan Motor Removal

• Blower assembly removal

<Classic10>

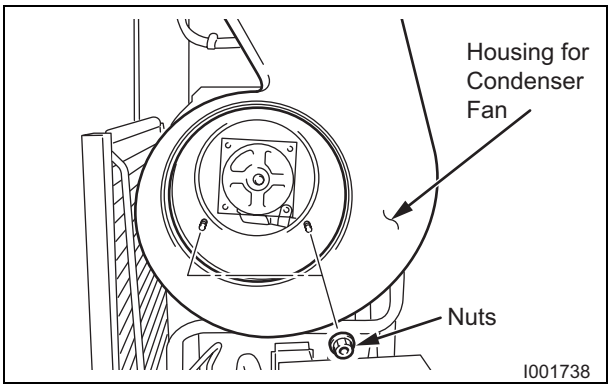




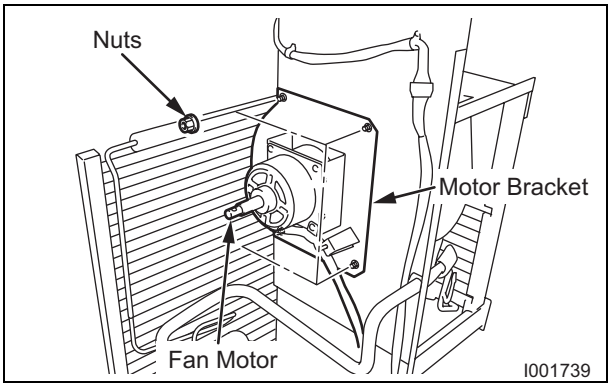
1) Loosen the set screw with a hex key, and then remove the condenser fan.

⚠ CAUTION

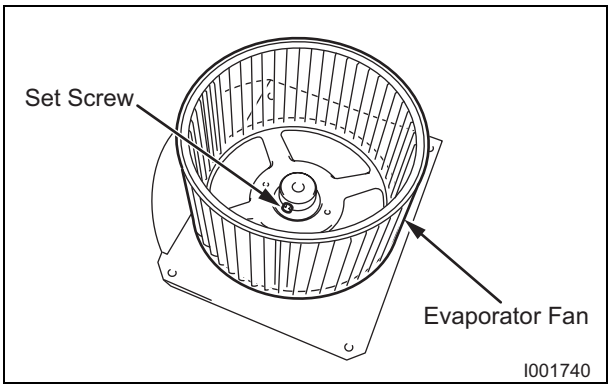
- Set Screw Torque Value (for Installation)
  - 14.7 N•m (11.8-17.7 N•m)
  - 10.8 lb•ft (8.7-13 lb•ft)



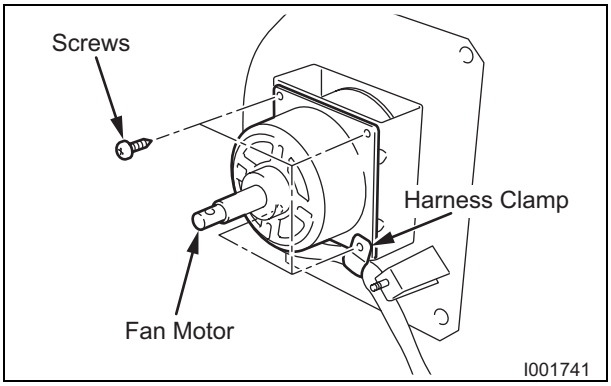
2) Take off the two nuts, and then remove the condenser fan housing.



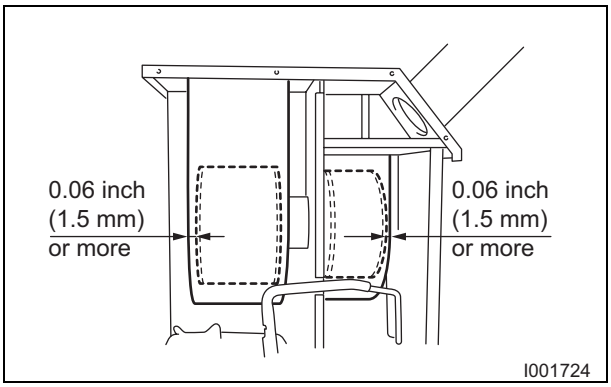
3) Take off the four nuts, and then remove the fan motor together with the motor bracket.



4) Loosen the set screw with a hex key, and then remove the evaporator fan.



5) Take out the four screws, and then remove the fan motor.

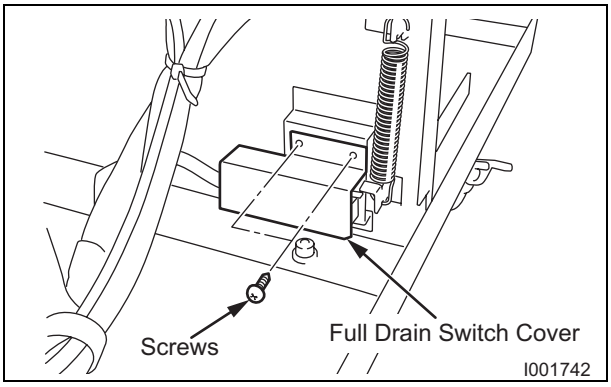


6) Verify the clearance between the fan and housing.

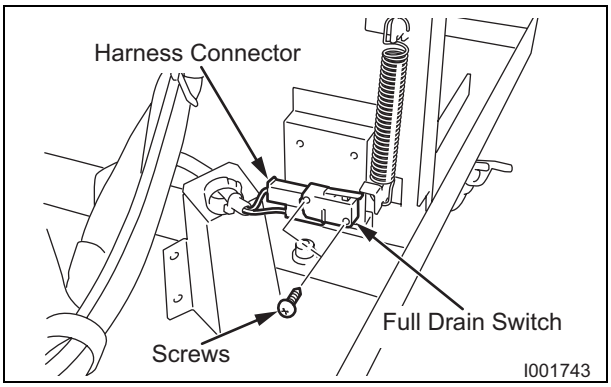
⚠ CAUTION

After installing the fan and fan motor, ensure that the clearance between the fan and housing is at least 0.06 inches (1.5 mm).

8.6 Full Drain Switch Removal



1) Take out the two screws, and then remove the full drain switch cover.



2) Unfasten the wiring harness connector.

3) Take out the two screws, and then remove the full drain switch.

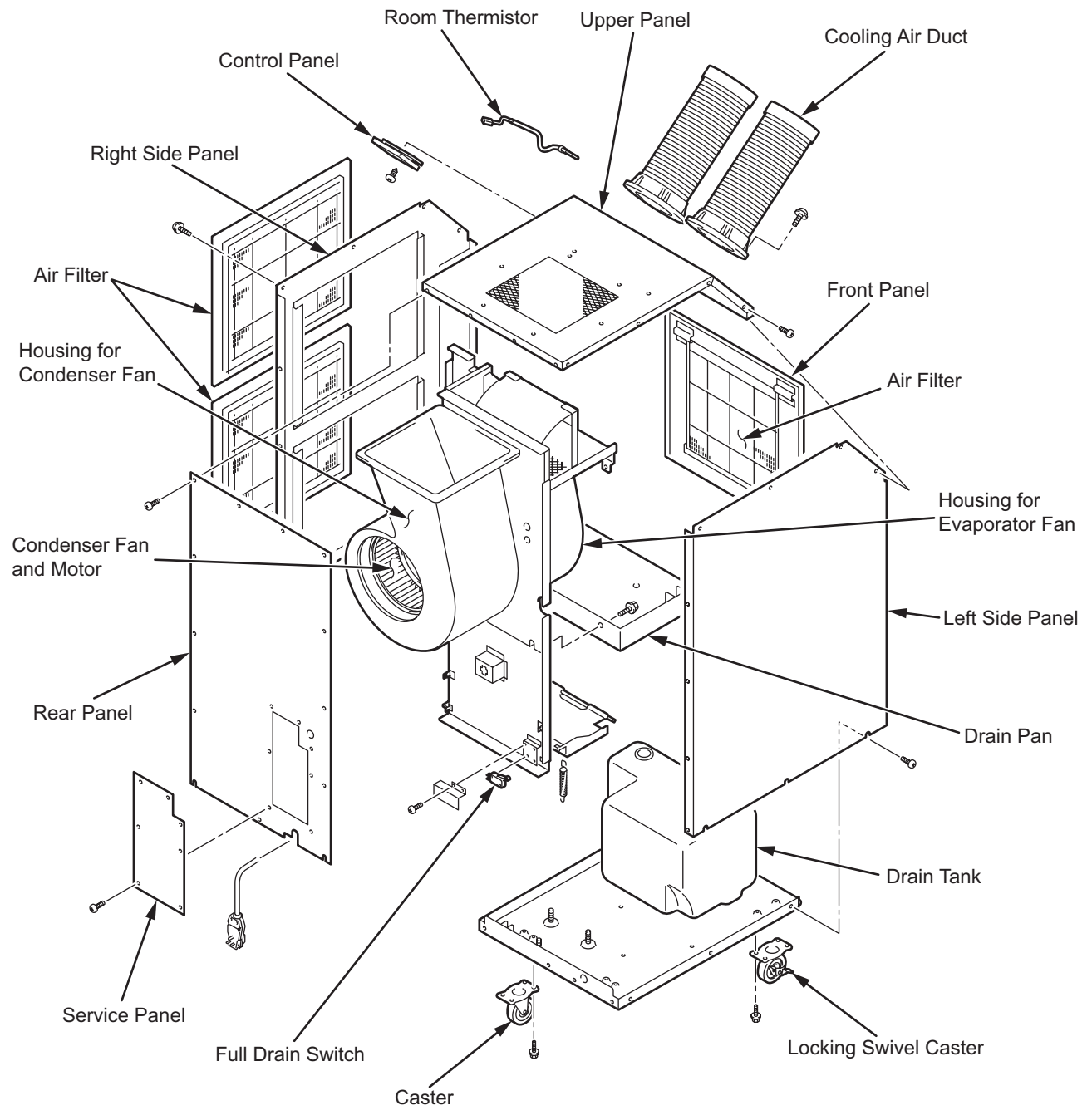
8.7 Assembly

- Assemble the parts and components in the reverse order of disassembly.

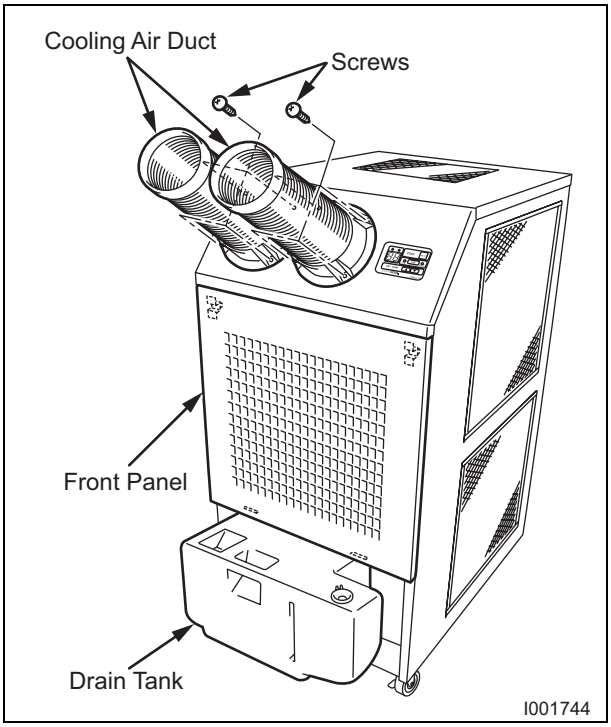
9. DISASSEMBLY (For Classic18)

9.1 Parts Construction

<Classic18>



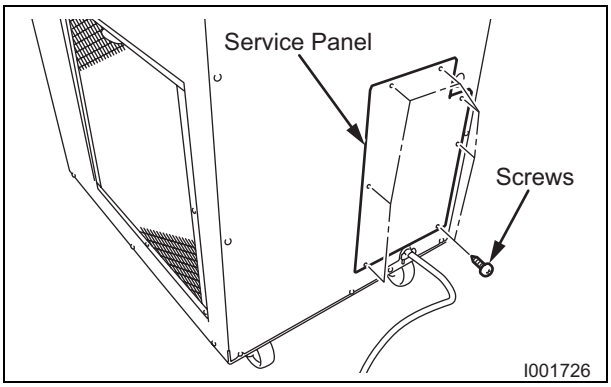
9.2 Disassembly



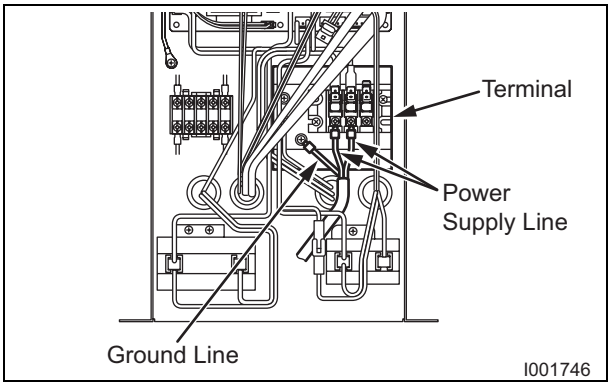
1) Remove the drain tank.

2) Unfasten the two clips and the lower-side hook, and then remove the front panel.

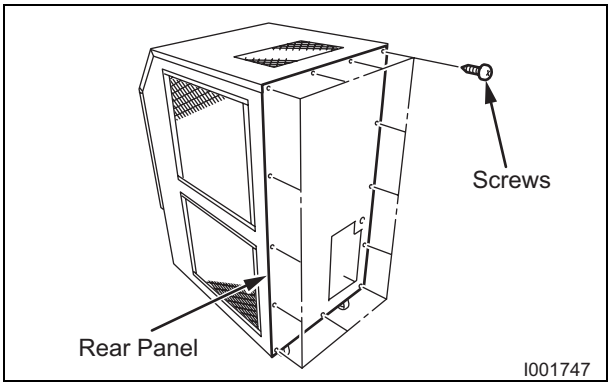
3) Take out the eight screws, and then remove the two cooling air ducts.



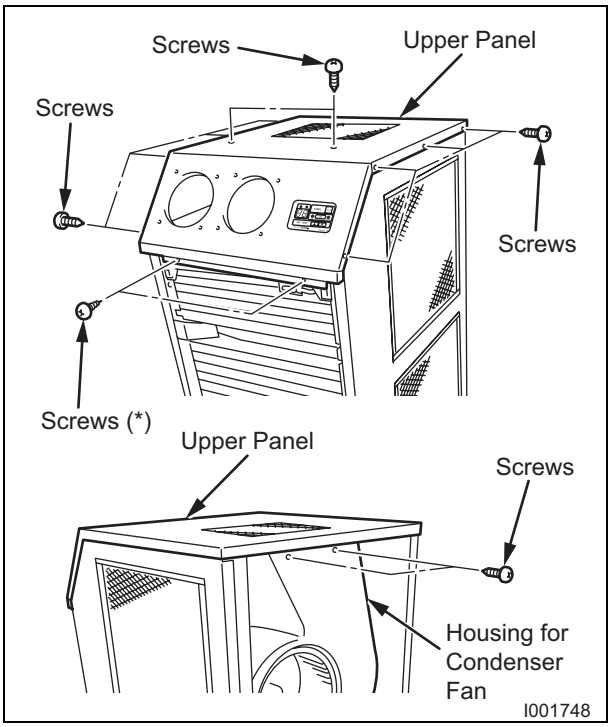
4) Take out the seven screws, and then remove the service panel.



5) Remove the two power supply lines from the terminal, and remove the ground wire.



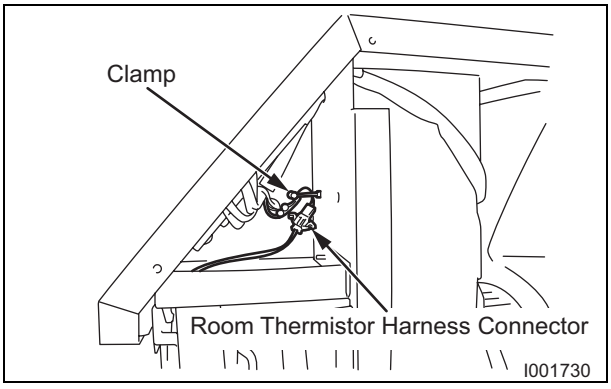
6) Take out the thirteen screws, and then remove the rear panel.



7) Take out the fourteen screws, and then remove the upper panel.

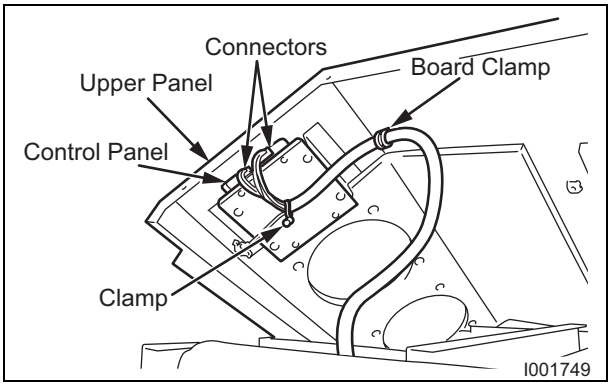
⚠ CAUTION

The two screws (*) used on the front side of the upper panel differ from the rest. Ensure that the correct screws are used when attaching the upper panel.



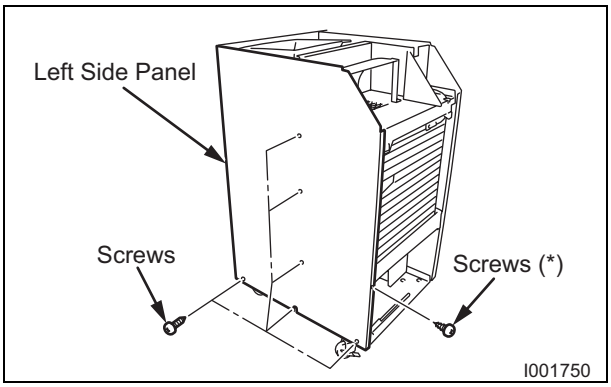
8) Unfasten the connector on the room thermistor wiring harness.

9) Remove the wiring harness from the clamp.



10) Unfasten the two connectors (11-pin, 5-pin) from the control panel.

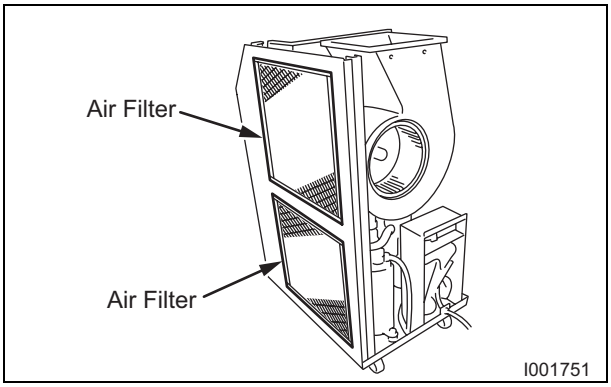
11) Remove the wiring harnesses from the clamp and board clamp.



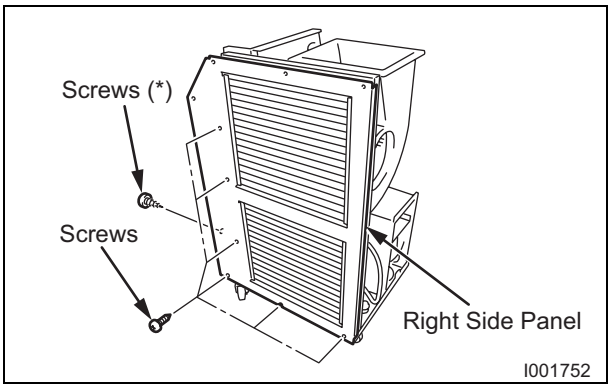
12) Take out the seven screws, and then remove the left-side panel.

⚠ CAUTION

The screw (*) on the front side of the left-side panel differs from the rest. Ensure that the correct screw is used when attaching the left-side panel.



13) Remove the two air filters from the right-side panel.

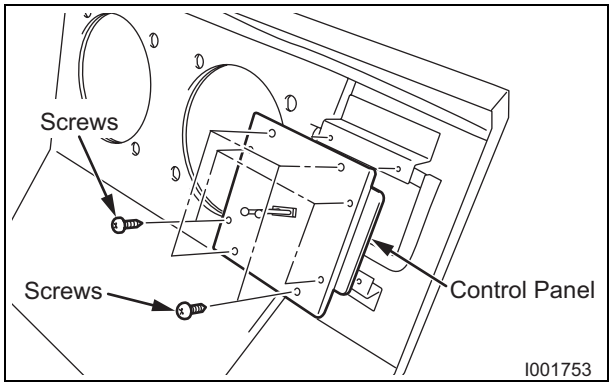


14) Take out the seven screws, and then remove the right-side panel.

⚠ CAUTION

The screw (*) on the front side of the right-side panel differs from the rest. Ensure that the correct screw is used when attaching the right-side panel.

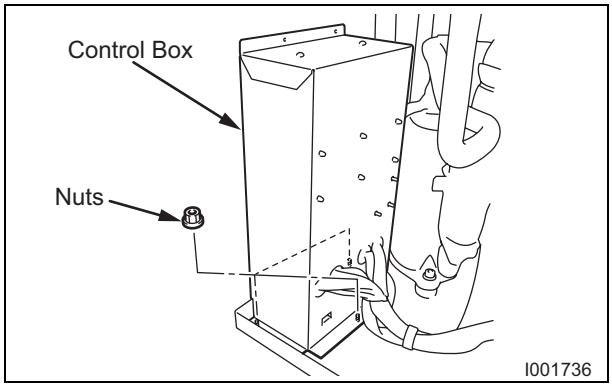
9.3 Control Panel Removal



1) Take out the eight screws, and then remove the control panel.

9.4 Electrical Components Removal

(1) Control box

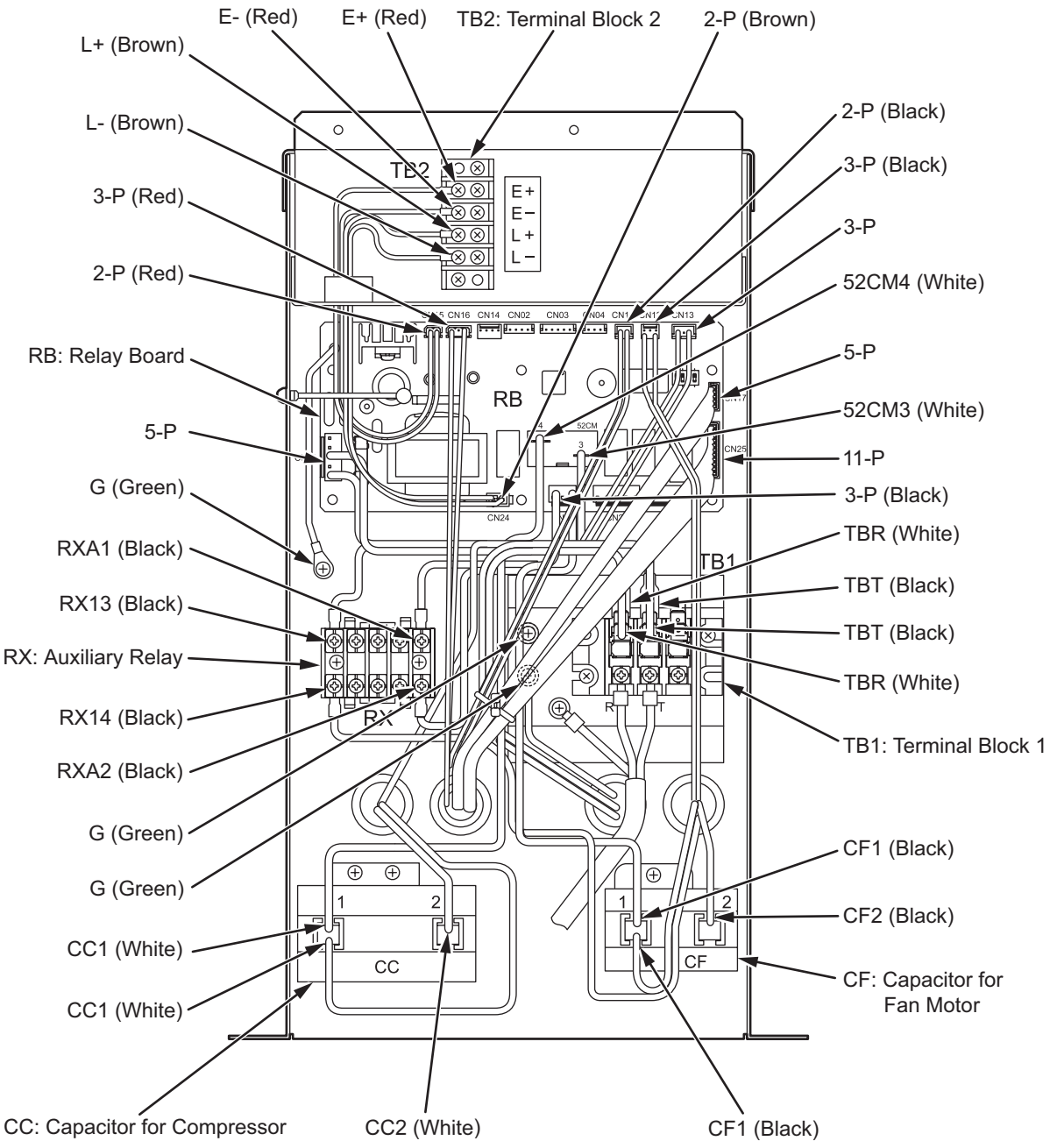


1) Take off the three nuts, and then remove the control box.

(2) Electrical parts and relay board removal

• Unfasten each connector, and then remove the electrical parts from the control box.

<Classic18>



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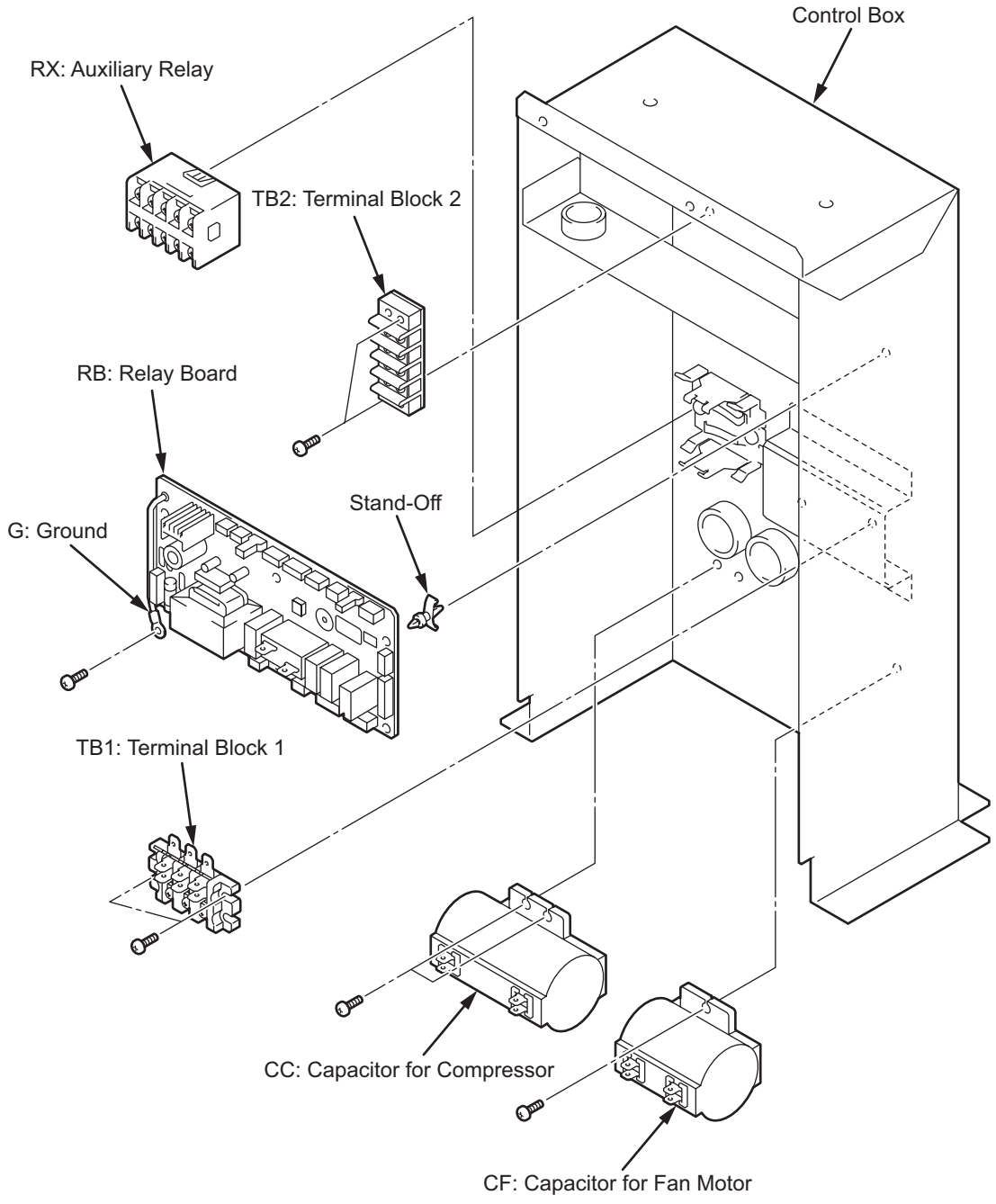
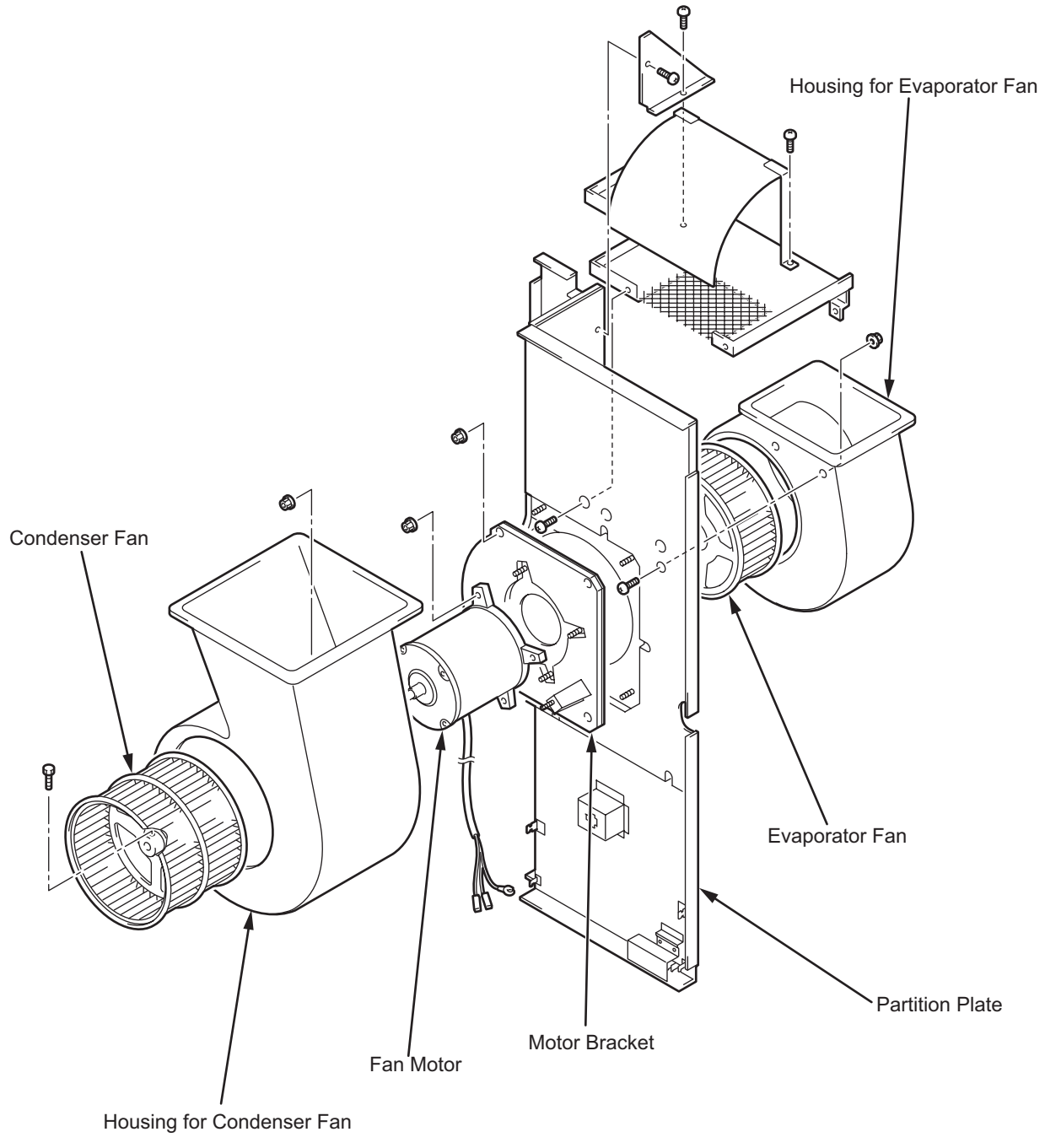
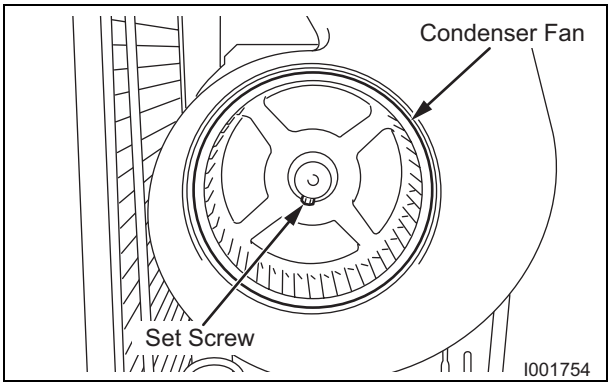

Control Box
RX: Auxiliary Relay
TB2: Terminal Block 2
RB: Relay Board
Stand-Off
G: Ground
TB1: Terminal Block 1
CC: Capacitor for Compressor
CF: Capacitor for Fan Motor
I001720

9.5 Fan Motor Removal

- Blower assembly removal

<Classic18>

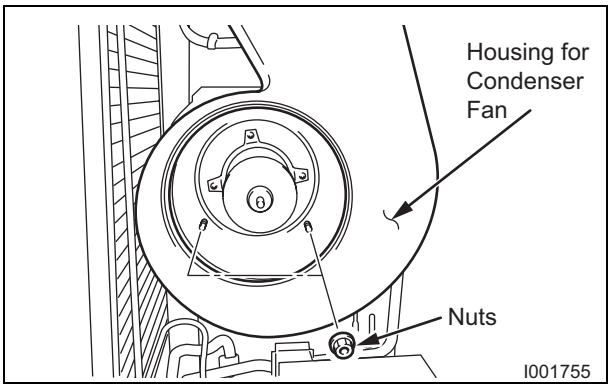




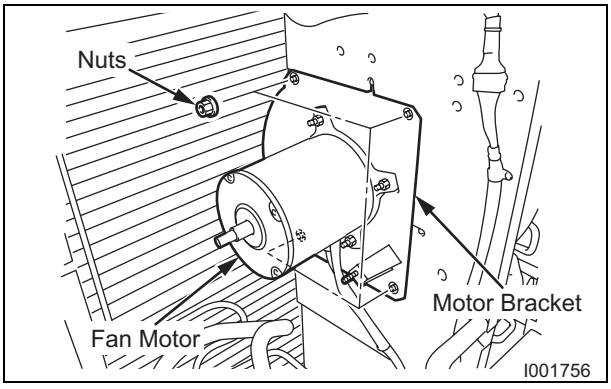
1) Loosen the set screw with a hex key, and then remove the condenser fan.

⚠ CAUTION

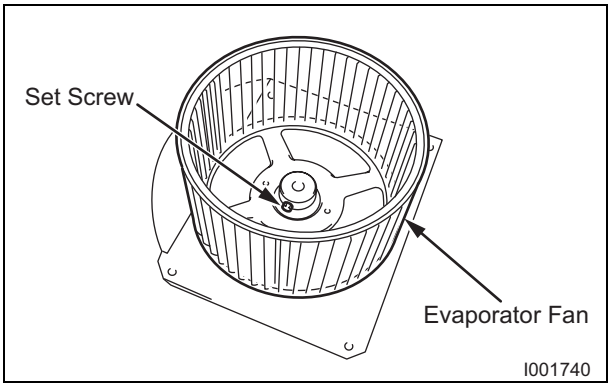
- Set Screw Torque Value (for Installation)
  - 14.7 N•m (11.8-17.7 N•m)
  - 10.8 lb•ft (8.7-13 lb•ft)



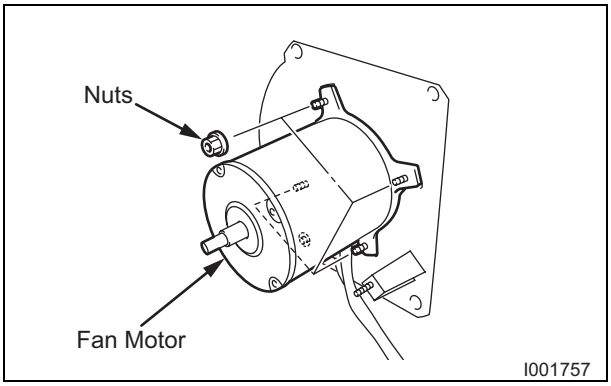
2) Take off the two nuts, and then remove the condenser fan housing.



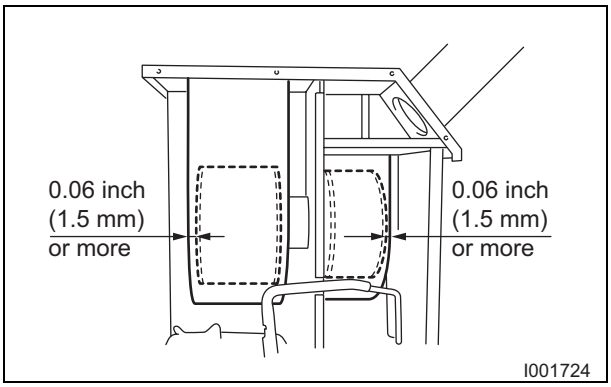
3) Take off the four nuts, and then remove the fan motor together with the motor bracket.



4) Loosen the set screw with a hex key, and then remove the evaporator fan.



5) Take off the four nuts, and then remove the fan motor.

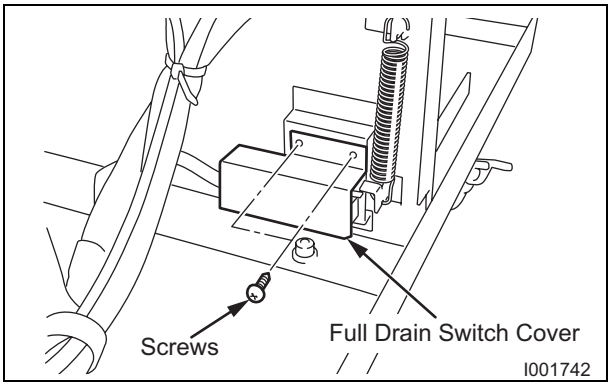


6) Verify the clearance between the fan and housing.

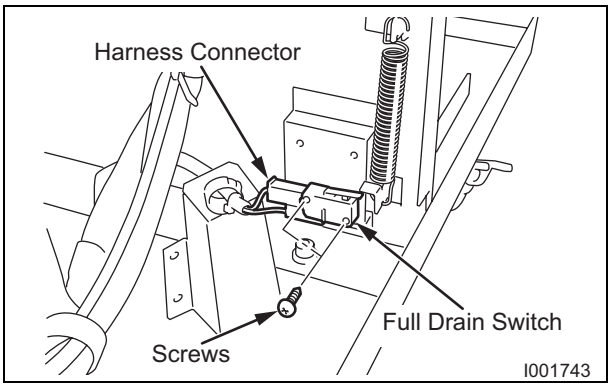
⚠ CAUTION

After installing the fan and fan motor, ensure that the clearance between the fan and housing is at least 0.06 inches (1.5 mm).

9.6 Full Drain Switch Removal



1) Take out the two screws, and then remove the full drain switch cover.



2) Unfasten the wiring harness connector.

3) Take out the two screws, and then remove the full drain switch.

9.7 Assembly

- Assemble the parts and components in the reverse order of disassembly.

10. REFRIGERANT SYSTEM REPAIR

10.1 Brazing

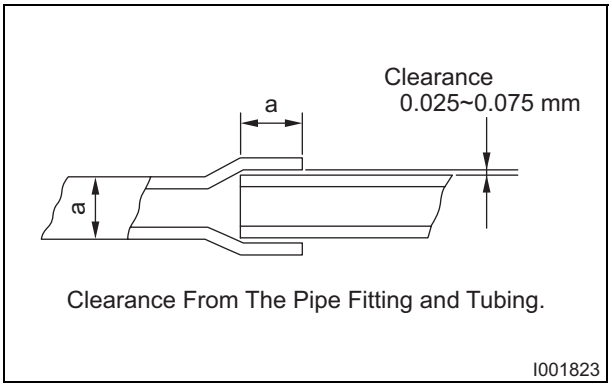
- In the event of a leak, obstruction, or trouble in the refrigerant system of the unit, replace or repair the defective component. After replacing defective component, braze all connections.

(1) Proper brazing techniques

- When brazing, use a slightly reduced flame. Oxyacetylene is commonly used since the flame condition can be easily judged and adjusted. Unlike gas welding, a secondary flame is used for brazing. Properly preheat the base metal according to the shape, size and thermal conductivity of the brazed fitting.
- The most important point in flame brazing is to bring the entire brazed fitting to a proper brazing temperature. Care should be taken not to cause overflow of the brazing filler metal, oxidation of the brazing filler metal, or filler metal deterioration due to overheating the flux.

(2) Brazed fittings and fitting clearance

- In general, the strength of the brazing filler metal is lower than that of the base metal. As such, the shape and clearance of brazed fittings are very important. Concerning the shape of brazed fittings, adhesive area must be maximized. In addition, the clearance of the brazed fitting must be minimized so that the brazing filler metal will flow into the fitting via capillary action.



Clearance From The Pipe Fitting and Tubing.

I001823

(3) Cleaning brazing filler metal and piping

- When the refrigerant system has been opened, exposure to heat may cause the brazing filler metal to stick to the inside and outside of the piping. Brazing filler metal may also combine with oxygen in the air to form an oxide film. In addition, grease and oils may stick to the pipe during handling. All these factors will reduce the effectiveness of brazing. Therefore, excess brazing filler metal must be removed with sand paper, and by thorough cleaning with a solvent such as Trichlene.

(4) Dry Nitrogen gas use

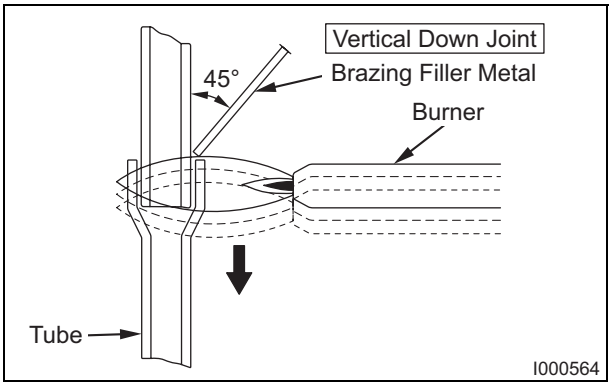
- During brazing, the inside of the pipe undergoes an oxidative reaction due to the brazing flame. Introduce dry nitrogen gas (1 l/min.; adjust with the flow regulator) through the pinch-off tube of the refrigerant cycle to prevent oxidation.

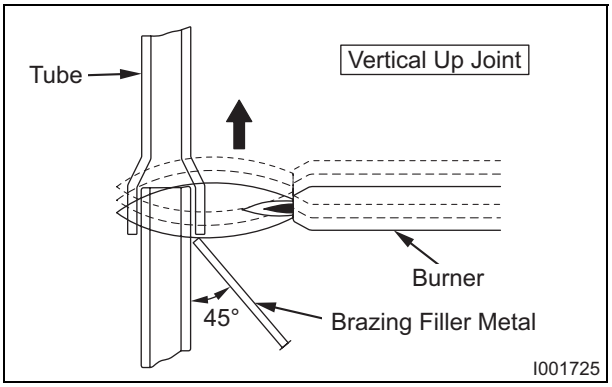
< NOTE >

Do not get foreign matter such as dirt, water, or oil into the piping.

(5) Vertical joints

- For vertical joints, heat the entire brazed fitting to the proper brazing temperature. Bring the brazing filler metal into contact with the fitting so that the brazing filler metal begins to flow.
- Stop heating the fitting as soon as the brazing filler metal has flown into the gap (clearance). Since the brazing filler metal flows easily into portions heated to the proper temperature, the entire fitting must be kept at the proper brazing temperature.





10.2 Removal of Refrigerant System Components

⚠ CAUTION

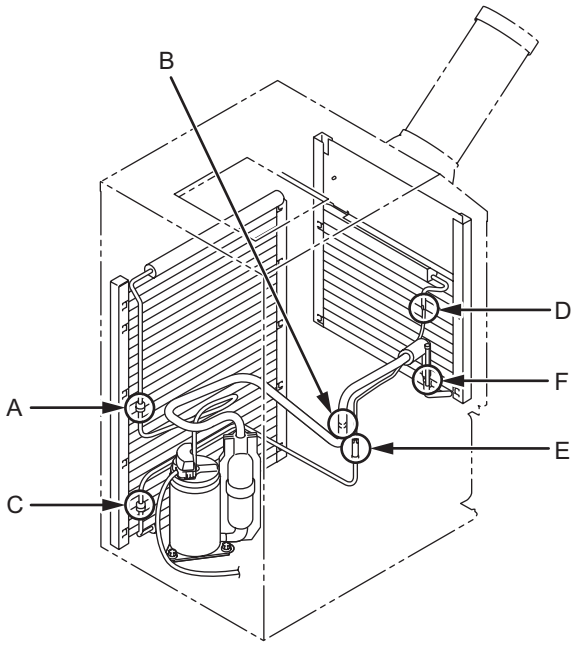
- Before any refrigerant cycle component can be replaced, recover the refrigerant using the standard recovery procedures and equipment.
- To prevent oxidation, pump dry nitrogen (flow rate 1 l/min) through the pinch-off tube while brazing.
- During any component replacement involving brazing, shield nearby components from the flame using materials such as a steel plate, or asbestos.

- Evaporator
- Capillary tube
- Condenser
- Compressor

< NOTE >

Hold the compressor body, not the tube, when carrying the compressor.

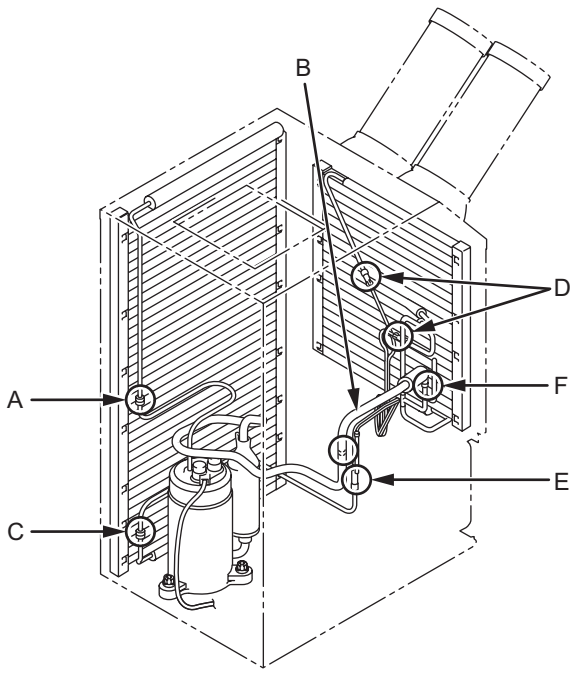
<Classic10>



Part to Replace	Disconnect at
• Compressor	• A&B
• Condenser	• A&C
• Capillary Tube	• D&E
• Evaporator	• E&F

I001706

<Classic18>



Part to Replace	Disconnect at
• Compressor	• A&B
• Condenser	• A&C
• Capillary Tube	• D&E
• Evaporator	• E&F

I001904

10.3 System Refrigerant Charging

- Always ensure that the refrigerant system has been properly evacuated before charging with the specified amount of R-22.

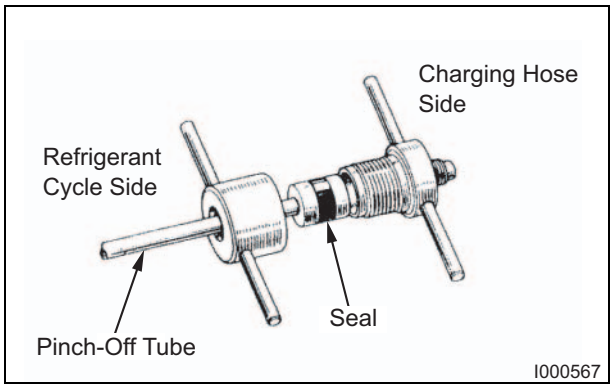
⚠ WARNING

• When handling refrigerant (R-22), always observe the following precautions:
- **Always wear proper eye protection while handling refrigerant.**
- **Maintain the temperature of the refrigerant container below 104 °F (40 °C)**
- **Perform repairs in a properly ventilated area. (Never perform repairs in an enclosed environment.)**
- **Do not expose the refrigerant to an open flame.**
- **Never smoke while performing repairs, especially when handling refrigerant.**
- **Ensure that the liquid refrigerant does not come in contact with skin.**

⚠ WARNING

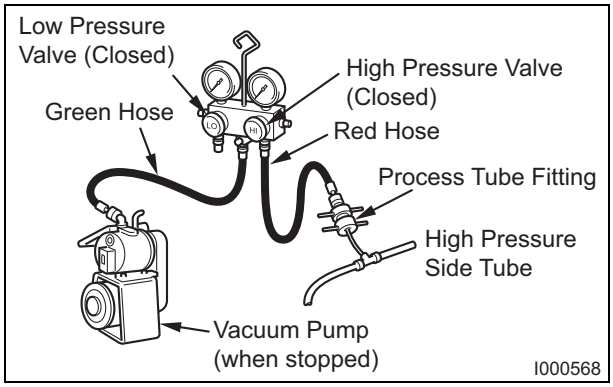
• If liquid refrigerant contacts eye or skin:
- **Do not rub the affected areas.**
- **Splash large quantities of cool water on the affected areas.**
- **Apply clean petroleum jelly to the affected skin.**
- **Seek a physician or go to a hospital for professional treatment.**

(1) Gauge manifold connection



1) Use a pipe cutter to completely remove the crushed end of the pinch-off tube on the high-pressure side of the refrigerant cycle.

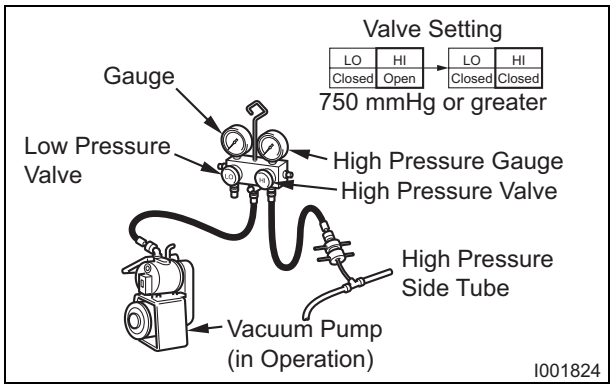
2) Fit the process tube fitting to the pinch-off tube.



3) Connect the charging hoses (red = high-pressure side) for the gauge manifold to the process tube fitting.

4) Connect the charging hose (green) at the center of the gauge manifold to the vacuum pump.

(2) Evacuation

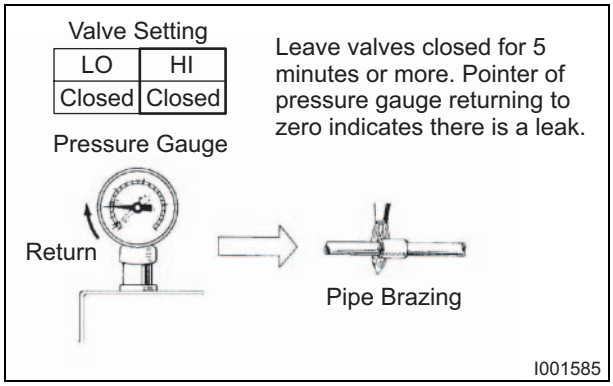


1) Open the high-pressure valve (HI) of the gauge manifold.

2) Turn on the vacuum pump to start evacuation. (Evacuate the system for approximately 15 minutes.)

3) When the high-pressure gauge indicates at least 750 mmHg (30 in. Hg), close the gauge manifold high-pressure valve and turn the vacuum pump off.

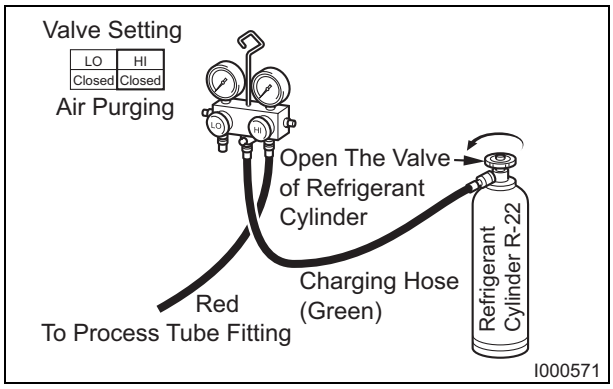
(3) Vacuum check

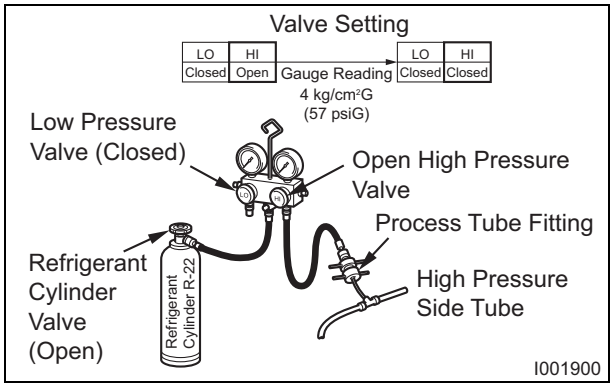


1) Leave the gauge manifold high-pressure valve and the low-pressure valve closed for five minutes or more. Confirm that the gauge pointer does not return to zero.

2) If the gauge pointer returns gradually to zero there is a leak somewhere in the system (this could also include the gauge manifold). Perform a leak check according to the procedure indicated in the next step. Once the leak has been found and repaired, evacuate the system again, and confirm that the system holds vacuum.

(4) Gas leak check





1) Remove the charging hose (green) from the vacuum pump, and connect the hose to the refrigerant cylinder (R22).

2) Open the refrigerant cylinder valve, loosen the nut on the gauge manifold side of the charging hose (green) for air purging and tighten the nut as before.

3) Open the gauge manifold high-pressure valve. Charge the system with refrigerant until the high-pressure gauge indicates 57 psiG (4 kg/cm^{2}G). After charging is complete, close the high-pressure valve.
(Occasionally verify the high-pressure gauge pressure reading after closing the high-pressure valve.)

4) Check carefully for gas leaks inside the refrigerant system using the gas leak tester.

5) Repair any leaks.

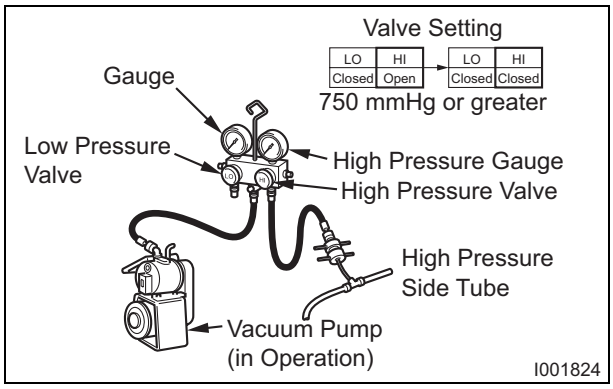
⚠ WARNING

Do not attempt any repairs on a charged system.

⚠ WARNING

Before checking for gas leaks, fully confirm that there is nothing flammable in the area to cause an explosion or fire. Contacting refrigerant with an open flame generates toxic gas.

(5) Evacuation (repeat)



1) Close the refrigerant cylinder valve. Next, remove the charging hose (green) from the refrigerant cylinder, and then connect the charging hose to the refrigerant recovery machine.

< NOTE >

Keep the gauge manifold high-pressure valve and the low-pressure valve closed.

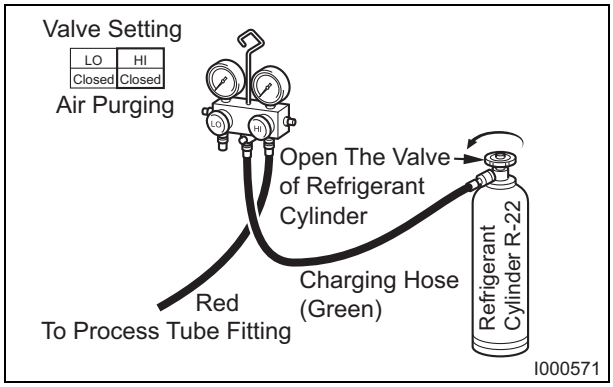
2) Using procedure in the “Evacuation”, evacuate the system until the high-pressure gauge indicates 750 mmHg (30 in.HG) or greater (for 15 minutes or more.)

3) After evacuation is complete, close the gauge manifold high-pressure valve.

⚠ CAUTION

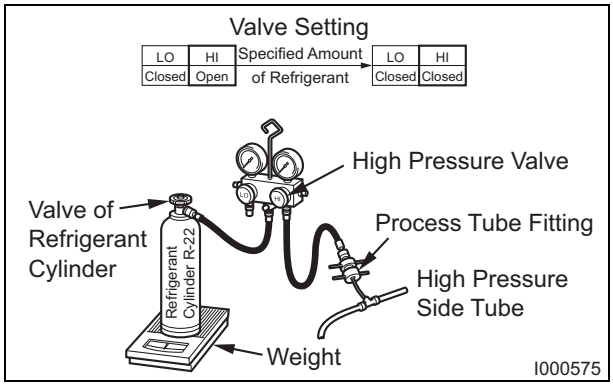
Always evacuate the system at least twice using the repetitive vacuum method. Evacuate the system an additional time on rainy or humid days.

(6) Refrigerant charging work



1) Remove the charging hose (green) from the vacuum pump, and then connect the charging hose to the refrigerant cylinder (R-22).

2) Open the refrigerant cylinder valve, loosen the nut on the gauge manifold side of the charging hose (green) for air purging and tighten the nut as before.



3) Securely place the refrigerant cylinder on a scale with a weighing capacity of 70 lbs (30 kg) that is graduated to 0.2 oz (5 g).

4) Open the gauge manifold high-pressure valve and the refrigerant cylinder valve. Charge the system with the specified amount of refrigerant.

Standard Refrigerant Amount:

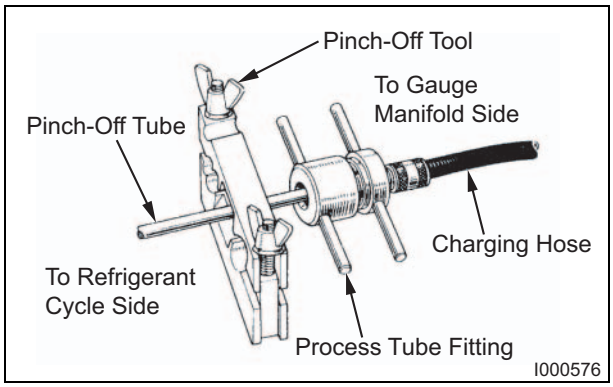
- Classic10: 1.06 lbs (480g)
- Classic18: 1.59 lbs (720g)

⚠ CAUTION

The amount of refrigerant charged has a great influence on the cooling capacity of the unit. Charge to the specified amount, always observing the scale graduations while charging.

5) Close the manifold high-pressure valve and the refrigerant cylinder valve.

(7) Gauge manifold removal



1) Crimp the pinch-off tube with a pinch-off tool.

2) Remove the gauge manifold and the process tube fitting. Crush the end of the pinch-off tube.

3) Braze the end of the pinch-off tube.

4) Ensure that no gas leaks from the pinched-off portion and the brazed end.

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